MUSHROOMS

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MUSHROOMS

FLY AMANITA (AMANITA MUSCARIA)
A Deadly-Poisonous Mushroom

MUSHROOMS

A Handbook of Edible and Inedible Species

BY

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FULLY ILLUSTRATED

BOSTON AND NEW YORK
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PREFACE

The interest in wild mushrooms and the number of people who collect wild mushrooms for the table are increasing rapidly as the use of automobiles makes it possible for millions of people to get to the fields and woods where mushrooms grow. At the same time, whenever there is a good mushroom season, the newspapers report an increasing number of cases of mushroom poisoning. These facts indicate the great desirability of a wider dissemination of the knowledge necessary to distinguish intelligently the common edible and the poisonous mushrooms. It was with these facts in mind that it was decided to prepare this book in the hope that it might help our friends to make use of the abundance of excellent food that annually goes to waste in the fields and woods, without risking their lives in the act.

It is believed that the photographs and descriptions here presented will enable any one with a little persevering study to determine accurately the great majority of the mushrooms that he finds commonly, and it is hoped that the book will prove useful to students who are beginning the study of fungi, and to Boy Scouts, Girl Scouts, and Camp Fire Girls who wish to become acquainted with this fascinating group of plants, as well as to the layman whose only object may be to supply his table with delicious food. The scale used in many of the photographs is ruled

according to the metric system and the figures on it, therefore, indicate centimetres and not inches. Those who are not familiar with the metric system will not be inconvenienced by this if they merely remember that two and one half centimetres very nearly equal an inch.

I am indebted to Mr. A. H. Eldredge for the two photographs of *Amanita muscaria*. I am further indebted to Houghton Mifflin Company for skillful and accurate reproductions of my photographs and for calling my attention to various obscurities in the text.

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MUSHROOMS

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FUNGI

Most of the plants that we are familiar with have parts that are conspicuously green in color. This green color is due to the presence of a substance called 'chlorophyll,' or 'leaf green.' 'Leaf green' is in a sense the most important substance in the world because by means of this substance green plants are able to manufacture starch and sugar from air and water. Starch and sugar form the basis of all kinds of food, and therefore we are entirely dependent upon green plants for all of the food that we eat.

Now fungi are plants of simple organization, with neither roots, stem, nor leaves, and having no 'leaf green.' They, therefore, like animals, are unable to manufacture food from air and water and are dependent upon green plants just as we are. Some of them get their food from living plants or animals and for this reason are called 'parasites.' Many of these are the causes of serious diseases. Others obtain their food from the dead remains of plants or animals and are called 'saprophytes.' All of these fungi produce fruits in which are found little reproductive bodies, called 'spores,' that take the place of seeds. There are thousands of kinds of fungi that produce fruits that are so small that one has to use a microscope in order to see what they are like, but others have fruits that are large enough to be seen readily with the naked eye.

MUSHROOMS AND TOADSTOOLS

EVERY botanist is asked frequently how to tell a mushroom from a toadstool. As a matter of fact there is no difference between a mushroom and a toadstool. Every fungus that produces a fleshy or woody or jelly-like fruit-body, which is large enough to be studied without a microscope, may be called a mushroom, or, if it is stool-shaped, it may be called a toadstool. Personally I prefer to call them mushrooms. There are hundreds of kinds of mushrooms, very many of which are edible, and many not edible, but only a few of which are poisonous. The question then should be, not how to tell a mushroom from a toadstool, but how to tell edible from poisonous mushrooms, or edible from poisonous toadstools. The answer is practically the same as it would be if the question were how to tell sweet apples from sour apples without tasting. One must learn the botanical characters of each kind, and learn them so well that he recognizes the various kinds at sight as easily as he recognizes the members of his own family. It cannot be too strongly emphasized that there is no such thing as a 'rule' by which the edible kinds may be distinguished from the poisonous. It must be remembered that mushrooms are the fruits of fungus plants, and it is no more difficult to learn fifty kinds of mushrooms than it is to learn fifty kinds of trees or fifty kinds of birds. A child, on being introduced to different kinds of fruits for the first time, may mistake

a pear for an apple, but after he has once learned them he does not make that mistake. Neither will one mistake one kind of mushroom for another after he has once learned them; but no one should eat any kind of mushroom until he has learned to recognize it at sight and to call it by name.

THE MUSHROOM PLANT

Life-History and Development

The vegetative part of the mushroom plant, in most cases, grows entirely within the substratum or material on which it lives. This material may be the soil, or rotten wood, or the bark or wood of a living tree, depending on the kind of mushroom. This vegetative part of the plant consists of a network of branched threadlike structures called 'hyphæ,' the whole mass of hyphæ taken together being called the 'mycelium.' The spawn which can be purchased from seedsmen consists of this mycelium mixed with the soil and manure in which the plant grew.

The life-history of the fungus plant begins, not in a seed, but in a spore. A single spore is usually too small to be seen with the naked eye, and consists of a tiny bit of living protoplasm enclosed within a membrane or wall as an egg is enclosed in its shell. The spore is very light and may float about in the air for a very long time, or may be carried by the wind for many miles. When, however, it chances to fall upon a suitable substratum, which is sufficiently moist and warm, it germinates — that is, a little threadlike hypha grows out from one side and into the substratum; and there it continues to grow and branch and forms the mycelium or plant-body.

The mycelium sometimes grows quite rapidly, but sometimes rather slowly, and it may take weeks or months, or even years, for it to mature sufficiently to

THE DEVELOPMENT OF A MUSHROOM (AMANITA VERNA)

be ready to produce fruit. When it has matured and the conditions for fruiting are suitable, if it happens to be a fungus that produces umbrella-shaped mushrooms, little knots or knobs appear, here and there, on the threads of the mycelium. These are very small at first, but they gradually enlarge and finally become large enough so that they begin to project above the surface of the soil or other substratum. These structures are developing fruit-bodies or mushrooms, and in this very young stage they are spoken of as 'buttons' or button stages. If we were to cut one of these buttons in two, lengthwise, we should find that it is already a little umbrella, but the umbrella is closed and is entirely covered with a membrane or veil which is called the 'outer' or 'universal' veil. The cut shows several stages in the development of one of these buttons into a mushroom. The species shown there is *Amanita verna*, 'the destroying angel,' a very pretty but deadly poisonous plant. It will be seen from the photograph that as the button grows the outer veil, after being stretched to its limit, is broken. In this species it splits at the top and remains at the base of the stem as a cuplike structure, sometimes called the 'death-cup,' but more properly called the 'volva.' The great majority of mushrooms, however, do not have a volva, because the outer veil is torn loose at the bottom and remains wholly or in part on the top of the mushroom, or is so thin and delicate that it disappears entirely, and no trace of it can be seen.

There is a second veil, called the 'inner' veil, which extends from the outer edge of the top part of the mushroom to near the upper end of the stem. When

the umbrella opens up, this veil is stretched to its limit and finally gives way. In the case of *Amanita verna*, and a large number of other species, it is always torn loose at its outer edge and remains on the stem, forming a ring around the stem. In some species, however, it tears loose from the stem and clings to the outer edge of the umbrella, and in a very large number of species it is so delicate that it very quickly shrivels away and is rarely seen at all. The fate of these two veils, as the mushroom develops, is very important, as we shall see later, in the classification of mushrooms.

Structure

Let us now examine a little more closely the structure of a mature mushroom of the umbrella type. We find that it consists of a stem, or 'stipe,' and an expanded portion which is called the 'cap,' or 'pileus.' If our mushroom happens to be an *Amanita*, it will have also a cuplike structure, or volva, at the base of the stem, and a ring, or annulus, farther up on the stem. There are some kinds of mushrooms which have a volva but no ring, others which have a ring but no volva, and many which have no ring and no volva. Also the character of these structures, when present, differs greatly in different kinds of mushrooms. The ring may be very large and thick and conspicuous, or very small, delicate, and inconspicuous. Again, the volva, in some cases, is not at all cuplike, but clings to the base of the stem like a close sheath, or it may be broken up and appear as patches on the lower end of the stem.

We see also that on the under side of the cap there are numerous thin, bladelike structures which extend from the stem to the margin of the cap. These are called the 'gills' or 'lamellæ.'

If, now, we should cut a very thin slice from any part of the stem or cap and examine it with a strong magnifying-glass or a microscope, we should find that it is made up of a large number of threadlike hyphæ similar to those that compose the mycelium, but that they are crowded so close together that they form a compact body.

The spores of the mushroom are produced on the sides of the gills. An examination of the surface of one of the gills under sufficient magnification would show us that certain of the hyphæ which end there are modified into club-shaped structures, each club having four tiny projections at its end. At the end of each of these little projections a spore is borne. The club-shaped structure on which the spores are produced is called a 'basidium,' and all fungi which produce their spores on basidia are called 'Basidiomycetes.' (See Fig. 1.) Usually also there are present on the surface of the gills larger and longer club-shaped bodies called 'cystidia.' These project much farther than the basidia and, at least in some kinds of mushrooms, serve to prevent the gills from getting too close together, and thus insure for the spores sufficient room to develop and be liberated.

Spore Production and Liberation

The spores, as we have said, are produced on structures called 'basidia.' These basidia are microscopic

in size, so that there is room for a very large number on each gill, and, since each basidium usually produces four spores, the spores are produced in very great

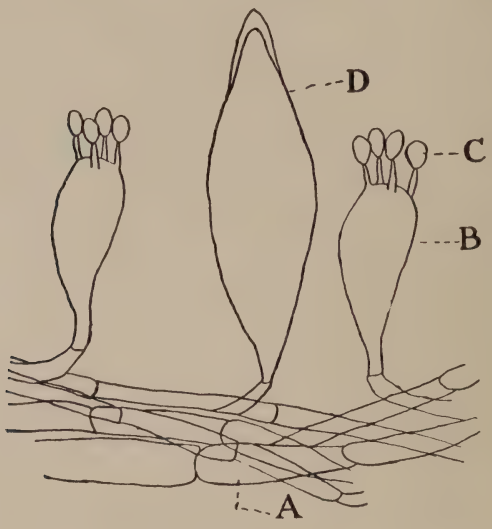


FIG. 1

Cross section of a very small portion of a gill showing hyphæ, *A*; basidia, *B*; spores, *C*; and a cystidium *D*; greatly enlarged.

numbers. According to Professor Buller, of the University of Manitoba, a single large specimen of the cultivated mushroom, or meadow mushroom, *Agaricus campestris*, may produce as many as 1,800,000,000 spores, while a large shaggy-mane mushroom has been estimated to produce 5,240,000,000 spores. But some other kinds of mushrooms do even better, since a single giant puffball may produce as many as 7,000,000,000,000 spores. Of course such a production allows for an immense waste, and it is probable that

not more than one in 20,000,000, and perhaps much fewer than that, ever succeeds in growing.

When the spores are mature, they are discharged forcibly from the basidia. They are projected outward at right angles to the surface of the gill for a distance equal to something less than one half the distance between two adjacent gills. This gives them a clear pathway to fall downward.

Certain kinds of mushrooms have a special means of making sure of the proper liberation of their spores. In the shaggy-mane mushroom (page 75), for instance, and in others belonging to the same group, the gills are very close together, but at maturity they deliquesce or dissolve into an inky fluid. This is in no sense comparable to the dissolving of chemical substances, but is a process of auto-digestion (self-digestion). The spores on these gills mature in a very definite order, beginning at the lower ends of the gills and ripening progressively upward. As the cap begins to open up and becomes bell-shaped, the lower ends of the gills are slightly separated from each other. There the spores mature and fall, and at once auto-digestion sets in and removes the now useless parts of the gills, thus leaving a clear path for the fall of the spores from higher up. This continues until all the spores have fallen and the gills have entirely dissolved.

OTHER TYPES OF MUSHROOMS

So far we have been talking only of the umbrella type of mushroom. There are, however, a number of other types of fungi that are just as truly mushrooms and among which there are some valuable edible kinds. The oyster mushroom, *Pleurotus ostreatus* (page 108), for instance, has gills, but instead of being umbrella-like it is shelf-like and is attached at one side to the wood on which it grows. There are also a large number of shelf-like mushrooms which do not have gills at all, but, instead, we find on the under side of the shelf a large number of little pores or tubes (page 118). The spores are produced on the inner surfaces of these tubes. They are produced on basidia, just as in the gill fungi, so that if one were to examine the inner surface of one of the tubes, sufficiently magnified, it would look very much like the surface of a gill. Many of these pore fungi are woody or leathery and tough, and therefore not good to eat, but a few of them are fleshy and tender and very good. There are also a large number of fungi that are umbrella-shaped, but have pores instead of gills (page 119). These are mostly fleshy and tender, some of them being edible and some of them poisonous.

There are a number of other groups of mushrooms that produce their spores on basidia. Among these are the hedgehog fungi (page 123) and the club fungi (page 121). The hedgehog fungi are so called because they bear many spinelike branches on the surface of

which the spores are produced. These spines always hang downward, no matter in what position the fungus is growing, and this fact serves to distinguish the hedgehog fungi from the club fungi, since in the latter the branches always project upward.

Still another important group of mushrooms is the puffball group (page 125). These are particularly safe for beginners to use on the table, since there are no poisonous ones among them. The larger kinds are all excellent if used while they are still pure white all the way through. They must always be cut in two and examined before using, however, since if one has begun to darken inside, although it may not be poisonous, it will be very bitter and will spoil a whole dishful. The spores of a puffball are produced on basidia that are scattered through the greater part of the interior of the mushroom, and when they are mature they can easily be 'puffed' out by pressing on the sides of the puffball.

All of the groups of the mushrooms so far mentioned produce their spores on basidia and are, therefore, Basidiomycetes. There is another very large group of fungi, which includes a few mushrooms, which produces its spores in a very different way. This is the group of sac fungi or Ascomycetes, so called because their spores are produced within little saclike structures. A great majority of the sac fungi have very small fruit-bodies and grow as parasites on other plants. These are very important and very interesting as the causes of plant diseases, but they are not mushrooms. A familiar example of a mushroom belonging to this group is the morel (page 129), the

spongelike mushroom which is collected for the table by so many people in early spring. If we were to cut a very thin slice at right angles to the surface of a morel and examine it with a microscope, we should find a large number of little elongated sacs, each one containing eight spores. These sacs are scattered thickly over the whole surface of the cap. There are several other types of mushrooms belonging to the sacfungi group, some of them edible and a few of them slightly poisonous. The 'truffles,' which are so highly prized in certain European countries, are sac fungi.

THE ECOLOGY OF MUSHROOMS

By the ecology of plants we mean their relations to the environment in which they live. No fungus can ever go through its entire life-history wholly independent of other living or dead organisms, nor without being greatly affected by heat, light, water, character of soil or other substratum, etc. The study of these various interrelations is not only extremely interesting, but is necessary to a proper understanding of the life of mushrooms.

Dissemination

An important ecological consideration is that of the methods by which the spores are scattered. As we have said, the spores are discharged forcibly, but in the case of the gill fungi, it is merely to get them away from the gill so that they can fall freely, and they need to be scattered by some external means. This is in most cases done by the wind. The spores of a mushroom are exceedingly light and the slightest air-current is enough to carry them away. For this reason very few of the spores fall below or near the fruit-body that produces them. Practically all of them are caught up by air-currents before they reach the ground, even in the case of short-stemmed mushrooms, and they may be carried by the wind for many miles. This is undoubtedly the most important means of spore dissemination. Spores often stick to the bodies of slugs, and other small animals that feed

upon the mushrooms, and are disseminated in that way, but that is a method of minor importance.

The sac fungi also discharge their spores forcibly, the eight spores in each sac being hurled forth together in a cluster. Usually a considerable number of sacs discharge their spores at the same time, and then it is several minutes before any others are discharged so that at periodic intervals a cloud of spores may be seen issuing from the fruit-body. Sometimes a distinct hissing sound resulting from the discharge of many spores at the same time may be heard.

Gravity

The force of gravity and its effect on plants is practically the same all over the surface of the earth. For this reason it is of more interest from a physiological than from an ecological point of view. But it will be of interest to note here, in passing, the importance of the way in which it affects mushrooms. It is the force of gravity which causes the stems of flowering plants to grow upward and the roots to grow downward. Likewise it causes the umbrella type of mushroom to grow upright and with its cap horizontal. If the mushroom encounters an obstacle as it comes up, or if it grows from the side of a tree or stump, the stem always curves in such a way as to bring the cap into a horizontal position. The significance of this fact is that if the cap is not horizontal, so that the gills are vertical, the spores, when they fall, will strike against the sides of the gills, and when they do that they always stick fast and never fall off. So sensitive are the gills themselves to the force of gravity

that if a cap is laid on a table with one side raised higher than the other by an object placed under it, the gills will gradually move in such a way as to bring themselves into as nearly a vertical position as possible.

Air

The composition of the atmosphere — that is, the relative amounts of the different gases, and the dust particles in it — is of considerable importance to some kinds of plants, but ordinarily it is not of any great importance in connection with mushrooms.

Heat

A certain amount of heat is necessary for the growth of any plant. There are very few kinds of mushrooms that ever grow at all during the winter. There are many kinds, however, that are found only in early spring, others that occur only during the warmer part of the summer, and still others that grow only in autumn, while there are some that occur throughout the growing season. Also, there are many species that are found only in the warm countries of the tropics, while others occur only in temperate or colder regions. However, it is very difficult to say whether these differences are due primarily to heat or not. There are so many causes acting on plants at the same time that it is often impossible to single them out without performing control-experiments, and we are very apt to ascribe certain effects to heat when they really are due primarily to other causes. The differences between spring and summer or spring and

autumn mushrooms are probably not due primarily to temperature, though the differences between tropical and cold-climate species may be.

Light

Light is not nearly so important to mushrooms as it is to green plants. In fact most fungi grow better in the dark than in the light. There are, however, many species that grow only in the shade of other plants, while others grow only in open sunny places. The difference in the amount of light is probably not the only reason for this, but, in some cases, it may be the principal one. Many kinds of mushrooms, too, grow very well in the dark, but cannot produce perfect fruit-bodies unless they have light. The fact that fungi can grow in the dark makes it possible for them to flourish in places where no other plants can exist. In underground caves, mines, etc., certain kinds of fungi are practically the only plant life.

The length of day has been found to have a great influence on the growth and time of flowering of higher plants, and this may be an important factor in determining which mushrooms shall produce their fruits in spring when the days are long and which in autumn when the days are much shorter.

Substratum

The material on which a fungus grows, whether it be soil, wood, bark, dead leaves, or other substance, is spoken of as the 'substratum.' There is scarcely any kind of substratum that is not suitable for some kind of fungi, but many of the mushrooms are limited to

very definite kinds of substratum. There are a number of species, for instance, that grow only on dung; others that are found only on leaf-mold or rich humus in woods; while still others prefer the soil of pastures, lawns, etc. There are many kinds, too, that occur only on wood, and of these, some are quite cosmopolitan and grow on various kinds of wood, while others are found only on the wood of a particular kind of tree. A number of mushrooms spend their lives as parasites on other living plants, but these will be spoken of again later.

Water

As is the case with nearly all plants, water is one of the most important factors affecting the life of mushrooms. Plants are often separated into three groups based on the relative amount of water necessary for their successful growth. Those plants that can get along with a very small amount of water are called 'xerophytes,' while those that require a very large amount are called 'hydrophytes,' and those that flourish best when supplied with a medium amount of water are called 'mesophytes.'

We are apt to think of all fungi as requiring a great deal of water for their best development. That is true of a large number of fungi, but by no means of all. The great majority of mushrooms are mesophytes, while others, especially some of the shelving forms that grow on wood, are pronounced xerophytes. Practically all of these require an abundance of water for the development of their fruit-bodies, but they do not flourish in a soil that is continuously

saturated with water. For this reason one often finds that in a wood, of which part is very low land and part higher land, many more kinds of mushrooms are found on the higher land than on the low land. Nevertheless, in the case of most mushrooms no fruit-bodies are developed except during rainy weather so that a wet season is always a good mushroom season. Although some of the smaller mushrooms do literally 'spring up over night,' the most of those that are large enough to be worth collecting for the table require at least two or three days for their development. During a dry season, therefore, a single rain is not likely to bring us a good crop of mushrooms. It must be followed within one or two days by a second or third in order to complete the development of those fruit-bodies that were started by the first shower, and the very best time for mushrooms is when it rains a little every day or two.

Parasites and Saprophytes

A considerable number of our mushrooms are quite destructive parasites. The heart-rots of forest trees are in most cases due to the growth of the mycelium of certain shelving mushrooms. There are also a few kinds, such as *Armillaria mellea* (page 81), which are parasitic on the roots of trees and sometimes kill the trees which they attack. Many of the umbrella type of mushroom, as well as some puffballs, are more or less harmless parasites on the roots of trees and other plants, causing the production of structures known as 'mycorrhizas.' These will be discussed presently. There are also a number of mushrooms

that are parasitic on other mushrooms. The commonest of these, perhaps, is *Stropharia epimyces* (page 84), which is a parasite on the shaggy-mane (page 75) and the inky-cap (page 76) mushrooms. This plant never grows independently on the ground and it has never been found on any other than these two mushrooms. It is probable that some time in the past it grew on the ground side by side with, and in competition with, the shaggy-mane and inky-cap, but in some way it gained the mastery over its 'tender and tasty neighbors' and forced them to supply it with food, but by doing so it has made itself entirely dependent upon them. There are a few other species that grow as parasites on other mushrooms, but they are not often found.

Many of the wood-destroying mushrooms are parasitic for a part of their life and saprophytic during the remainder. That is, they start their life-history in a living tree, but after the tree has been killed they continue to live upon it. These fungi are often spoken of as 'wound parasites,' because the only way they can ever get a start in a tree is through a wound, caused by the breaking off of a limb or by other means. No tree would ever become affected with a heart-rot if it were never wounded or if its wounds were always properly taken care of, and one of the main objects of modern tree-surgery is to prevent mushroom spores from getting into the wounds of trees to grow and produce diseases.

There are also some wood-destroying fungi that live only saprophytically. *Lentinus lepideus*, for instance, is an umbrella-shaped mushroom which is

very fond of growing on railroad ties. It used to cause a great deal of damage until the railroad men learned how to treat their ties with chemical preservatives which make them unfit for mushroom food. The umbrella-shaped mushrooms as a group have always been considered as pure saprophytes. Certainly very many of them are, but it is probable that many more than was formerly thought are at least partly parasitic.

Mycorrhizas

Remarkably interesting structures from an ecological point of view are the so-called mycorrhizas. A mycorrhiza is a combination of root and fungus; that is, it is a root with a fungus either growing inside of it (endotrophic mycorrhiza), or growing on the outside and entirely covering it with a coat of mycelium (ectotrophic mycorrhiza). Only the very smallest rootlets can form mycorrhizas, because they are attacked by the fungus very soon after the rootlet is produced, and the rootlet is always killed within a year, so that the mycorrhizas are never more than a year old.

In the case of those mycorrhizas in which the fungus is inside of the root, the fungus is usually parasitic on the root for a time and has very much the best of the bargain. Later on, however, the fungus gets tired of the struggle and the root gradually gets the upper hand and finally succeeds in digesting and devouring the fungus. Some of our forest trees, especially the maples, have this type of mycorrhiza, as also have many other plants, such as the orchids.

Indeed, many of the orchids have become entirely dependent upon the mycorrhizal fungi. In some orchids the seeds will not germinate except in the presence of the proper fungus, while in others the seeds will germinate, but the seedlings never grow beyond a certain stage unless they become associated with the fungus. The kinds of fungi that cause this type of mycorrhiza are in most cases not known, because their fruit-bodies have not been seen. Only a few of those associated with the orchids have been identified and in no case were they found to be mushrooms.

The other type of mycorrhiza (ectotrophic), in which the mycelium of the fungus is mostly on the outside of the root, is found on many of our forest trees, such as oak, hickory, beech, linden, etc., as well as on many shrubs and herbaceous plants. These mycorrhizas were until recently not very well understood. They were first described about thirty years ago, and for a long time after that it was thought that they were of great importance to the plants in which they occur, in that they helped to absorb from the soil certain materials which the plants would otherwise be unable to get. It is now believed, however, that they are of no benefit in any way to the plants on which they occur. The fungus is merely a parasite on the root. Ordinarily these parasites are quite harmless to a tree because only a small percentage of its roots are affected, and it really does not suffer any more than it would if we were to cut off a few of its roots or pull off a few of its leaves.

It seems likely, therefore, that these mycorrhizas

are of much more importance in the life of the fungi which cause them than they are to the plants on which they are found. It is now known that most if not all of the ectotrophic mycorrhizas are caused by mushrooms. It is probable that very many of our late summer and fall mushrooms, especially those which grow in the woods, are capable of forming mycorrhizas on the roots of trees. The fruit-bodies of these mushrooms are usually produced soon after the mycelium becomes attached to the roots, and it is probable that the fungi have great need of the particular kind of food that they get from the roots for the development of the fruit-bodies.

Any one can observe these mycorrhizas by digging up some of the roots of trees growing in the woods in the fall of the year. They appear as little clusters of short, stubby root-branches, usually white or whitish, but sometimes colored brown, yellow, red, etc.

Animal Relations

We have already spoken of the way in which animals aid in the scattering of mushroom spores. There are a number of other ways in which animals affect the life of mushrooms. Chief among these, perhaps, is the destruction of the fruit-bodies. Many animals feed upon mushrooms. Sheep, for instance, are very fond of certain kinds, especially the larger puffballs. Squirrels feed upon many kinds of mushrooms and even collect them and store them away for future use. Rabbits, also, make use of these delicacies whenever they get a chance, and it is said that turtles are quite fond of varying their diet by eating mush-

rooms. Slugs habitually feed upon various kinds of mushrooms, as likewise do crickets.

But the greatest amount of destruction is brought about by still smaller animals. Maggots, which are the young of small flies or gnats, are sometimes very destructive in beds of cultivated mushrooms. The eggs of these insects are usually laid just at the top of the stem where it is attached to the cap. They hatch in about three days, and at once bore into the mushroom and riddle it in a short time. Seven to ten days later they burrow into the ground, and, after spending from four to seven days there, they emerge as adult gnats and each one lays about one thousand eggs for the next generation. So abundant are these gnats that in hot weather there are certain kinds of wild mushrooms that become infested so quickly that it is almost impossible to collect any that are fit to eat.

Mushroom mites are sometimes troublesome. These little insects are closely related to the cheese mites and they multiply even more rapidly. It is very difficult for mushroom-growers to get rid of them because they cling to the bodies of flying insects and are thus carried from place to place.

A very interesting interrelation of mushrooms and animals is found in certain tropical countries. Occasionally while one is walking through a tropical forest he sees in front of him a distinct green line which seems to be in motion. Closer examination shows this to be composed of a large number of ants marching single file and each one carrying over its back a piece of green leaf. These are leaf-cutting ants, or 'umbrella ants' as they are sometimes called be-

cause of their habit of carrying pieces of leaves over their backs. They have made a visit to some tree and are now returning to their nest for the purpose of making a garden. The pieces of leaves will be chewed to a pulp and then spread out over a place that has been thoroughly cleaned off. On this they will plant the mycelium of a mushroom and in a few days they will have an excellent mushroom garden. These ants take good care of their garden, weeding out undesirable fungi, and in return they obtain an abundant supply of food. The mushroom which they cultivate is called *Rozites gongylophora* and is one of the umbrella type of gill fungi. Usually, however, the ants do not allow it to produce fruit-bodies. Years of cultivation has caused the fungus to produce abnormal out-growths — little, upright, club-shaped bodies — on its mycelium, and these are what the ants eat. Whenever the mushroom is allowed to fruit, it is necessary to clean off the garden and start over again.

Diseases

There are not very many diseases of mushrooms other than those due to animals. One, which is sometimes quite serious among cultivated mushrooms, is called the 'mycogone disease.' It is due to one of the sac-fungus parasites and causes the mushrooms to become deformed and unfit for market. A similar disease attacks a number of wild mushrooms.

A very peculiar and interesting disease is found on *Lentinus tigrinus* (see cut), a gill fungus which grows on rotten wood. It is due to a parasitic mold which grows over the gill surface to such an extent

LENTINUS TIGRINUS DISEASED BY A PARASITIC MOLD

that the gills, usually, are entirely hidden. So common are the diseased forms of this mushroom that it was formerly thought to be a perfectly normal condition.

Quite recently a disease of cultivated mushrooms due to a species of bacterium has been reported.

Fairy Rings

Certain mushrooms are often found growing in definite rings a few feet to twenty or more feet in diameter. These have been known as 'fairy rings,' because long ago it was believed that, when the fairies danced around in circles during the night, a mushroom sprang up in each place where a fairy stepped. The cause of the rings is that the mycelium which starts from a spore grows out in all directions forming a circular patch of mycelium, but as it grows it uses up all of the organic food in the soil and this causes the older parts of the plant, where the food has been exhausted, to die off. Each year the mycelium advances a little into soil containing a fresh food supply and produces a crop of mushrooms, while at the same time it dies off behind so that the ring increases in size from year to year. Such fairy rings are commonly formed by *Marasmius oreades* (page 107), *Agaricus silvicola* (page 72), and *Lepiota Morgani* (page 63), and sometimes by the giant puffball.

Sometimes a fairy ring produces a noticeable effect upon other vegetation so that the presence of the ring may be detected even when no fruit-bodies of the mushroom are present. The effect may be either an increase or a decrease in the luxuriance of the grasses and other plants. An increase in the growth of these

plants, when it is noticeable, is due to an increase in the available nitrogen compounds in the soil produced either by the breaking-up of organic foods by the growing mycelium or by the decay of the old dead mycelium. On the other hand, when there is a decrease in the growth of the vegetation this is caused by the mycelium becoming so thick in the soil that water cannot get through and the other plants suffer from lack of water.

Luminosity

The phenomenon of luminosity in living beings has been observed for a long time, though it is still not well understood. The fireflies that flit about just after sundown of a summer's evening are well known to every one. The light emitted by them is of short duration. Among the fungi there are certain species that emit light continuously, under proper conditions, for days or weeks. Most conspicuous among these is *Clitocybe illudens* (page 97), an orange-colored mushroom that grows in clusters about old stumps. The gill-surface of this mushroom is nearly always luminous, as can be observed after dark or by taking the fruit-bodies into a dark room. The mycelium of this plant is also luminescent, so that broken pieces of wood containing the mycelium often glow. The mycelium of *Armillaria mellea* (page 81) often causes rotten wood to glow in the same way.

Recently a Japanese species of *Pleurotus*, the genus to which our oyster mushroom (page 108) belongs, has been reported as luminous. Only the gill surface glows, but it is said that several of the fruit-bodies together can emit enough light to enable one to read by it.

MUSHROOM-GROWING

Mushrooms have been grown for market in European countries, especially in France and England, for a very long time. In more recent years they have been grown on an increasingly large scale in this country, so that now one can purchase mushrooms in the market at any time at prices usually ranging from a dollar to a dollar and a half a pound. These are grown mostly in specially constructed mushroom-houses or in greenhouses, but any one who has a well-ventilated cellar may grow mushrooms, provided he can control the temperature to a certain extent. The temperature should be kept between 50° and 60° F. If it gets colder than this the spawn will not grow, while if it gets much warmer the spawn or the growing crop will mold.

In making up mushroom beds well-cured manure from a horse stable should be used. The manure must be cured without allowing it to dry out or burn, but also it must not become too wet. When it is placed in the bed, it should be quite damp, but not wet, and should be evenly distributed and packed firmly to a depth of about six to ten inches. After allowing several days for the temperature to become adjusted, the bed will be ready to receive the spawn.

Spawn, which consists of the mycelium of a mushroom mixed with the substratum in which it grew, can be purchased from seed-houses in brick form. Each brick should be broken into eight or ten pieces

and the pieces planted about a foot apart in the manure, being covered to a depth of one or two inches. From one to two weeks after planting, the spawn will be seen to be growing and spreading. The bed should then be covered with about an inch of well-sifted, moist, light garden soil.

The amount of moisture present is very important. The air surrounding the beds ought to be nearly saturated with moisture constantly, and for this reason the beds must be protected from drafts which would blow the moisture away. If the manure has had the proper amount of moisture in it when it was put in, the beds probably will not need watering for several weeks. They must be watched closely, however, and when they begin to dry up water should be applied in a fine spray on and around the beds.

The first crop of mushrooms may be expected in about one and one half or two months after spawning, and one should be able to pick some every day or two for two or three months. They should be picked before the inner veil breaks and sent to market immediately. When all precautions have been taken, however, there may be 'crop failures' due to the presence of mushroom mites, which may destroy the mycelium as fast as it grows from the spawn, or to other animal or plant parasites. When a bed has ceased to produce, the material of which it is made up must be entirely cleaned out, the room fumigated, and the bed remade with new material.

FOOD VALUE OF MUSHROOMS

The value of mushrooms as articles of food lies chiefly in their flavors. If we were to measure their food value by the amount of energy that can be obtained from them, they would not rank very high. On that basis the food value of the cultivated mushroom is just about the same as that of cabbage, less than one half that of potatoes, or about one twelfth that of wheat flour. Oysters have a food value considerably less than that of potatoes, but nevertheless most of us enjoy oysters because of their flavor, and most of us can enjoy mushrooms as soon as we learn a few species so that we can eat them without fearing that they will end our earthly existence. The market price of mushrooms is prohibitive to the great mass of people, but there are tons of excellent wild species which are allowed to decay in the woods and fields every year. These will furnish variety and flavor to the daily menus of thousands of families, at a cost only of the time taken to collect them, as soon as people have learned to distinguish them one from another.

POISONOUS PROPERTIES OF MUSHROOMS

The genus *Amanita* is by far the most dangerous group of mushrooms. *Amanita verna* (page 54) and its very near relative *Amanita phalloides* have probably caused more deaths in this country than any other species. The active poison in these and closely related species is known as the '*Amanita* toxin.' Its chemical nature is not yet understood and no antidote for it is known. The clinical symptoms in poisoning by these mushrooms are practically always the same. For six to fifteen hours after the mushrooms have been eaten, no discomfort is felt. The patient is then suddenly seized by a severe abdominal pain, cramp-like in character and accompanied by vomiting. Paroxysms of pain and vomiting alternate with periods of remission, and the loss of strength is very rapid. Death usually occurs in four to six days in children and in eight to ten days in adults, but, if large quantities of the fungus are eaten, death may occur within forty-eight hours. One or two specimens are often enough to cause death. There is no satisfactory method of treatment. Of course medical advice should be obtained as soon as possible and every effort made to rid the alimentary canal of the poisonous material, but the absorption of the poison takes place so rapidly that even when the first symptoms appear it may be too late to save the patient. Stimulants should be employed freely in the hope of tiding the patient over the periods of weak-

ness, and narcotics should be used to relieve the intense pains. Atropin has no effect at all on this poison.

Another group of *Amanitas*, to which belong *Amanita muscaria* (page 55) and *Amanita cothurnata* (page 56), are entirely different in their poisonous properties. They are deadly poisonous, but in one respect they are not so bad as the other group, for there is an antidote for the poison. The poison is an alkaloid known as 'muscarin,' and atropin is a perfect physiological antidote for it. The clinical symptoms are quite different from those in the case of *Amanita verna*. The first signs of trouble usually appear in one to five hours. The patient shows excessive salivation and perspiration, a flow of tears, and vomiting. Mental symptoms are also present, particularly giddiness with confusion of ideas, and, sometimes, delirium and violent convulsions. Atropin should be given at once and in large doses, and at the same time the alimentary canal should be emptied of the ingested material as quickly as possible. Prompt action on the part of a competent physician should in most cases save the patient.

Other poisonous mushrooms, such as *Clitocybe illudens* (page 97) and *Lepiota Morgani* (page 63.) are usually not so dangerous as the *Amanitas*, and a physician, if called within a reasonable time, will, as a rule, be able to effect a cure.

COLLECTING WILD MUSHROOMS

The first and most important thing to be remembered by the person who is going to collect wild mushrooms for the table is that he must collect only such species as he is perfectly familiar with, and only such specimens as he is perfectly sure belong to one of those species. Any one who will accept a mushroom merely because the gills are pink or because the 'skin' of the cap will peel off, or merely because it is growing along with a well-known species or in a place where a well-known species has previously been collected, has no business collecting for the table, for he is certain, sooner or later, to get some poisonous specimens mixed in with the good ones. But any one who is willing to use common-sense, and reject all specimens that he is not sure of, may keep his table supplied with mushrooms with absolutely no danger; with no more risk than he takes when he goes into the vegetable garden and selects carrots, beets, and radishes, but rejects the wild parsnip which may grow as a weed there.

The beginner should collect at first only three or four of the more easily distinguishable species, such as *Morchella conica* (page 129), *Coprinus comatus* (page 75), *Agaricus campestris* (page 69), and the larger puffballs. Soon he will learn to distinguish also the other species of *Coprinus* and *Agaricus*. Then gradually he will add such species as *Pleurotus ostreatus* (page 108), *Pluteus cervinus* (page 79),

some of the *Lepiotas*, etc., and he will be surprised to see how soon he will have two or three dozen excellent edible species on his list.

The very best time to go mushroom-collecting, if convenient, is early in the morning, since at that time all those which have opened up during the night are fresh and free from insect infestations. The only thing that is at all essential for the work of collecting is a basket to carry the specimens in. It is well, however, to take along a garden trowel and to get into the habit of digging up the mushrooms instead of 'picking' them. This is because there are some species which even the expert cannot recognize unless he has the whole of the stem. If the mushroom is picked or broken off above ground, one of the most evident earmarks for identification, the volva (page 8), may be left behind in the soil.

All mushrooms that are not perfectly fresh should be rejected. Many cases of so-called mild mushroom-poisoning have been caused by the foolish eating of specimens infested by larvæ. 'Tainted' mushrooms are as unwholesome as 'tainted' meat. No one would expect a leg of mutton to be fit to eat which had been exposed in the woods for two or three days during hot weather. No more should be expected of mushrooms, for, although many of them will keep for a considerable time when the weather is cool, in warm weather they very soon become unfit for food.

While collecting the known edible species for the table, many beautiful and interesting fungi will be found which are not discussed in this book. If one becomes interested in knowing what they are, he must

obtain one or more of the larger books mentioned on page 143. If there are some which cannot be identified with the aid of those books, then it is permissible to send specimens to a known authority for identification. When this is done, the specimens should always be accompanied by a letter giving full information as to the appearance of the fresh specimens, their place and manner of growth, etc. The specimens should be wrapped in oiled paper, or groceryman's butter-paper, placed in a box, and mailed at once. In hot weather, or in case of specimens that are apt to decay quickly, it is well to wrap them first in a cloth that has been moistened with formalin, and then in butter-paper. Another way, which in some cases will serve even better, is to photograph the fresh specimen and then dry it, sending both the dried specimen and a copy of the photograph with the letter.

Whoever will learn a few species of mushrooms and begin collecting them for use will receive double remuneration for his time, for he will not only obtain excellent food absolutely free, but will get also the increased healthfulness that comes from stimulating walks in the open air. For any one who has already learned to love walking in the woods and fields there is no group of organisms that can furnish a more fascinating study than these lowly plants. The variety of form, color, and beauty is practically unlimited, and he who has never made a special study of any group of organisms can hardly realize the ecstatic pleasure with which the mycologist greets the first appearance each season of his old friends among the mushrooms, or with what unbounded joy he makes the acquaintance of species, to him, new or rare.

THE PREPARATION OF MUSHROOMS FOR THE TABLE

All mushrooms should be thoroughly washed, but they should be washed quickly and in cold water only, since warm water or a prolonged soaking in water injures the flavor of many kinds. Some kinds, however, are improved by soaking for some time in salty water. This is especially true of morels and other Ascomycetes. All specimens that are not perfectly fresh or that are in the least infested with insects should be thrown away. A few kinds should be peeled, but as a rule peeling removes some of the best-flavored parts. The stems of most species should be removed, though if the stems are very tender there is no reason why they should not be used. Mushrooms should not be kept long in a fresh condition. If they cannot be used at once, they should be partly cooked and placed in the ice-box, the cooking to be finished later.

As a rule mushrooms may be used in any way that oysters are used, or they may be cooked along with oysters, meat, poultry, or vegetables, or used as flavoring for soups and sauces, or for stuffing peppers. The better-flavored species should be cooked simply and seasoned lightly, while those of poorer quality may be improved by more elaborate cooking and more thorough seasoning. A few species that are slightly bitter when raw should be parboiled.

The majority of mushrooms, perhaps, are best

simply broiled or fried. To broil, the caps are placed, gills up, on a very hot broiling iron, sprinkled with pepper and salt, and a liberal piece of butter is placed on the gills. When the butter is all melted, the caps are turned over for a minute or two and then served hot on toast. To fry, place the caps in very hot butter or oil, fry about three minutes or longer depending upon the species, and serve on hot buttered toast with a sauce of lemon juice, melted butter, salt and pepper.

Some mushrooms are better baked or stewed. To bake, line the baking-dish with thin slices of toast, fill with layers of mushrooms, seasoning each layer with salt, pepper, and butter, and bake for fifteen minutes or longer according to the species. To stew the tougher species, boil them in water until they are tender, then pour off most of the water, add milk and stew a few minutes longer, season with salt, pepper, and butter, thicken with flour or cornstarch, and serve hot.

For the camp-fire lunch nothing is eaten with more appreciation by my students than sandwiches made as follows: Sprinkle the mushroom cap with salt and fry them for several minutes in a liberal quantity of butter. A frying-pan with a folding handle which may be increased in length by inserting a stick is used for this. Now roast frankfurt sausages or 'wienies' on the ends of sticks and place each 'wienie' with several mushrooms between the halves of a bun. Beefsteak may be substituted for the 'wienies,' but it takes much longer to cook it.

The following recipes are selected from Bulletin 175 of the United States Department of Agriculture:

Fried Mushrooms

Beat the yolk of an egg with a tablespoonful of water, and season with pepper and salt. In this, dip each cap and then dip into fine cracker crumbs or corn meal. Have butter or cooking-oil very hot in a frying-pan. Fry slowly on each side five minutes. A sauce can be made by thickening the butter or oil with flour and adding milk or cream. If desired, serve on toast. A smooth, thin tomato sauce is also excellent.

Mushrooms Baked with Tomatoes

In a baking-dish arrange small round slices of buttered toast; upon each piece place a rather thin slice of peeled tomato, salted and peppered; upon each slice of tomato place a fine, thick mushroom, gill side up; in the center of each mushroom put a generous piece of butter, season with salt and pepper. Cover the dish and bake in a hot oven ten minutes; then uncover and bake for an additional five or ten minutes, as the mushrooms seem to require.

Peppers Stuffed with Mushrooms

Cut the stem end of the peppers and carefully remove all seeds and the white membrane; chop or break the mushrooms into small pieces, season with pepper and salt, press firmly into the peppers, and put a good-sized lump of butter on top of each. The water adhering to the mushrooms after washing will furnish sufficient moisture for their cooking. Arrange the peppers on end in a baking-dish, having water, with salt, pepper, and butter, poured in to the depth

of about an inch. Place the dish in a hot oven, cook covered fifteen minutes; then uncover and baste and cook for ten or fifteen minutes longer, or until the peppers are perfectly tender. An addition of chopped cooked chicken or veal to the mushrooms is a pleasing variation.

Mushrooms and Cheese

Butter a baking-dish, place in layers mushrooms broken in small pieces, bread crumbs, grated cheese, salt, pepper, and bits of butter. Continue until dish is filled, letting the top layer be a thin sprinkling of cheese. Cover and cook in oven for twenty minutes; remove cover for five minutes before serving.

Mushroom Patties

Cut the mushrooms into small pieces, cook slowly in butter until tender, add cream or milk, pepper and salt, and thicken with flour. Fill the reheated patty shells.

THE CLASSIFICATION OF MUSHROOMS

The true fungi, excluding bacteria and slime molds, are usually grouped into three classes, the Phycomycetes, which includes the common molds, the Ascomycetes or sac fungi, and the Basidiomycetes. With the first of these classes we are not concerned, since it does not include any fungi with fruit-bodies large enough to be called mushrooms.

The second class, that of the sac fungi, includes a very large number of species that are important as the cause of plant diseases, but are too small to be called mushrooms, and a relatively few species that may be called mushrooms. The only edible ones, aside from the truffles, that are at all common are the morels and some of their near relatives, and a few of the larger cup-fungi (see pages 132–34).

The third class, that of the basidia-producing fungi, is predominantly the mushroom class. The five groups of this class, to which most of our edible mushrooms belong, are the puffballs (page 124), the pore fungi (page 112), the hedgehog fungi (page 122), the club fungi (page 121), and the gill fungi. By far the greater number of both the edible and the poisonous forms are gill fungi. For this reason we need to consider a little further the way of classifying these. First, however, it will be necessary to understand the naming of mushrooms.

It will be noticed that whenever we have mentioned the scientific name of a mushroom, we have used two

words. This is because it is a rule among botanists that every plant shall be given a name which consists of two Latin or Greek words, or other words in Latin form, the first of which is the genus or group name and the second of which is the species or individual name. All those mushrooms that are identically the same kind are given the same individual or species name, and then all of those species that seem to be closely related are grouped together and given the same genus name. Therefore, just as there may be a number of human individuals all having the same 'group' name, as Tom Jones, Sam Jones, and John Jones, so there may be a number of species of mushrooms all having the same genus name, as *Agaricus campestris*, *Agaricus avensis*, *Agaricus silvicola*, etc.

The various genera of gill fungi are distinguished from one another in part, by the color of the spores. In some genera the spores are white, in others they are pink, in others some shade of yellow or rust-color, in others purple-brown, and in still others they are black. A single spore of any mushroom is too small to be seen with the naked eye, but when a sufficient mass of them is obtained, the color can readily be recognized. If the stem is removed from a fresh mushroom and the cap is placed, gills down, on a sheet of paper and covered with an inverted tumbler, the spores will fall to the paper in great numbers, and within an hour or so an impression of the gill surface, consisting

FIG. 2
Spore print of Collybia radicata

entirely of spores, will be formed on the paper. Such an impression is called a spore print (Fig. 2). One of the first things to do, then, when the genus of a species is in doubt, is to make a spore print to determine the color of the spores.

USE OF THE KEY

In the key to the gill fungi on page 49, the genera are arranged in columns according to the spore color, and in the first column some other differences between genera are tabulated. Suppose now that on our first collecting trip we find a cluster of orange-colored mushrooms. We probably have seen the same kind before, but we do not know its name. We at once cut the stem from one specimen and place the cap, gills down, on a piece of white paper and invert a tumbler over it. If we can spare another specimen, we arrange it in the same way on a piece of black paper. Then with a specimen in hand we turn to the key. At the beginning of the key we find, 'I. Flesh vesiculose,' and three lines below, 'II. Flesh not vesiculose.' We cannot determine whether the flesh is vesiculose or not without a microscope. But this fact need not worry us, for this is the only place in the key that seems to require the use of a microscope and we can easily dispense with it here. There are only two genera, *Lactarius* and *Russula*, that have vesiculose flesh. The first of these can easily be distinguished from all other genera by the presence of an abundance of juice, usually milky, but sometimes colored, which exudes whenever the plant is wounded. The members of the other genus, *Russula*, are so characteristic in appearance (see page 52) that after we have collected a few of them we are not likely to mistake them for any other genus. We will remember also that the

species of *Lactarius* and *Russula* are all midsummer plants, very few of them being found before July or after August.

We easily decide, therefore, that our plant does not belong to either of the above genera and we turn to the next line after 'II. Flesh not vesiculose,' which is, '1. Caps fleshy or membranous.' Near the end of the key we find the corresponding '2. Caps tough.' Since the caps of our plants are distinctly fleshy, we proceed to the next line after '1. Caps fleshy or membranous,' which is, 'A. Stem central.' Five lines from the end of the key we find the corresponding 'B. Stem eccentric or absent'; but we see at once that our plant has a stem which is nearly if not exactly at the center, and we look at the next line, 'a. Gills free.' A few lines below is the corresponding 'b. Gills attached.' The meaning is, free from or attached to the stem. On examining our plant we find that the gills are not free from the stem, and we turn to the line following 'b. Gills attached,' which is, 'I. Stem fleshy.' Farther down we find the corresponding 'II. Stem cartilaginous.' This difference is sometimes rather difficult to determine, but if we break one of the fresh stems we find that it does not snap off like a piece of cartilage, but seems to be tough, fleshy and fibrous, and we look at the next two lines following 'I. Stem fleshy.' These are, '1. Ring present,' and, '2. Ring not present.' Since our plant has no ring on the stem, we turn to the next two lines, 'A. Gills adnate or sinuate' and 'B. Gills mostly decurrent.' 'Adnate' means attached squarely against the stem, 'sinuate' means attached to the

stem and having a distinct notch at the stem end, and 'decurrent' means attached to the stem and extending down some distance on it. Since the gills on our plant are distinctly decurrent, we turn to the next two lines, 'a. Gills much forked,' and 'b. Gills not much forked.' An examination of the gills of our plant shows that they are very seldom forked or branched. Therefore the plant must belong either to the genus *Clitocybe* or the genus *Flammula*, depending on the color of the spores. Turning now to our spore print we find that the spores are white and we know that we have a *Clitocybe*. We now read over the descriptions and examine the photographs of the different species of *Clitocybe* and easily determine that this orange-colored one is *Clitocybe illudens* and is not edible.

Let us take one other case. Suppose that on the opposite side of the same stump from which we collected the *Clitocybe illudens* we find some mushrooms that are brownish yellow in color and moist and sticky on the upper surface. We proceed as before and we find that this plant traces through the key in exactly the same way as the other until we come to the question as to whether the stem is fleshy or cartilaginous. In this case we find that a fresh stem when broken snaps off like a piece of cartilage and so we proceed to the next line after 'II. Stem cartilaginous,' which is, '1. Not reviving.' A little farther down is the corresponding '2. Reviving.' Reviving in this case means that the plant does not readily decay, but simply dries up and then when it is wet it revives and appears again to be a fresh plant. Plants which

will revive in this way are usually rather leathery or membranous. Our plant is so fleshy that we decide it could not dry up and then revive, and so we turn to the next line after '1. Not reviving,' which is, 'A. Gills adnate.' Three lines farther down is the corresponding 'B. Gills decurrent.' Our plant has the gills adnate, and so we look at the next two lines which are, 'a. Cap expanded,' and 'b. Cap conical.' An expanded cap is one that becomes nearly flat on top, while a conical cap is one that is rounded at the top and has sloping sides like the upper part of a cone. Since the cap of our plant is nearly flat, it must be either *Collybia*, *Naucoria*, or *Psilocybe*, depending upon the color of the spores. On examining our spore print we find again that the spores are white and our plant is therefore a *Collybia*. A study of the descriptions and photographs of *Collybias* readily leads us to the conclusion that this brownish-yellow one with a velvety stem is the 'Velvet-foot' mushroom, *Collybia velutipes*, which is a good edible species.

It will be noticed that in three places in the key two or three genera are bracketed together. This is because they differ from each other only in certain characters which are not used in the key itself. It is necessary, therefore, to learn the distinguishing differences between these genera. In the first of these cases *Cortinarius* and *Pholiota* differ from each other in that the ring of a *Cortinarius* is very much like a cobweb, while the ring of a *Pholiota* is membranous like that of other genera. In the second case *Inocybe* and *Hebeloma* differ from each other in that the caps of species of *Inocybe* are covered with silky fibrils or

very small hairs while the caps of *Hebolomas* are smooth, and *Bolbitius* differs from both *Inocybe* and *Heboloma* by having a cap which is thin and membranous and which becomes jelly-like as it gets old. Finally in the case of the third bracket the species of *Panœolus* are fleshy, while those of *Psathyrella* are very thin and membranous.

This key to the genera is not entirely complete. It includes all of the genera of gill fungi that are represented in this book, and a few others, but in order to make it as little complex as possible a number of less common genera have been left out.

Key to Genera of Gill Fungi

Spore color	White	Pink	Yellow	Purple	Black
I. Flesh vesiculose					
1. Juice milky	Lactarius				
2. Juice not milky	Russula		Russula		
II. Flesh not vesiculose					
1. Caps fleshy or membranous					
A. Stem central					
a. Gills free					
I. Volva and ring present	Amanita				
II. Volva only present	Amanitopsis	Volvaria			
III. Ring only present	Lepiota			Agaricus	Coprinus
IV. Neither volva nor ring present		Pluteus	Pluteolus		Coprinus
b. Gills attached					
I. Stem fleshy			Cortinarius		
1. Ring present	Armillaria		Pholiota	Stropharia	
2. Ring not present					
A. Gills adnate or sinuate	Tricholoma	Entoloma	Inocybe, Heboloma	Hypholoma	Panæolus, Psathyrella
B. Gills mostly decurrent			Bolbitius		
a. Gills much forked	Cantherellus				
b. Gills not much forked	Clitocybe		Flamula		
II. Stem cartilaginous					
1. Not reviving					
A. Gills adnate					
a. Cap expanded	Collybia		Naucoria	Psilocybe	
b. Cap conical	Mycena		Galera		
B. Gills decurrent	Omphalia				
2. Reviving	Marasmius				
B. Stem eccentric or absent	Pleurotus	Claudopus	Crepidotus		
2. Caps tough					
A. Gills serrate	Lentinus				
B. Gills entire	Panus				
C. Gills split	Schizophyllum				

THE PEPPERY LACTARIUS (edible)

Lactarius piperatus

The genus name *Lactarius* is derived from the word *lac*, meaning milk, and the species name *piperatus* is derived from the word *piper*, meaning pepper. The name is very appropriate for this mushroom, for whenever any portion of the cap, especially the gills, is wounded, there exudes from the wound an abundance of milky juice which is very peppery to the taste.

Lactarius piperatus is usually the commonest species of the genus. It occurs on the ground in woods from July to October and is a readily distinguished species.

The cap is at first convex, then expanded and somewhat depressed in the middle, and when fully mature it may be funnel-shaped. It is entirely white, smooth, even in the margin, and quite regular in shape. The cap is usually from 5 to 15 cm. (2 to 6 inches) broad.

The gills are very narrow and very much crowded. They are white or cream color and are attached to the stem, either adnate or decurrent. The gills are unequal in length and some of them are forked. The abundant white milk does not change color on exposure to the air. The gills, however, are sometimes spotted with yellow. The spores are white.

The stem is solid, smooth, and white. It is cylindrical or somewhat tapering downward, and from 2.5 to 5 cm. (1 to 2 inches) long. There is no ring and no volva.

Many people are afraid of this species because of its peppery taste. This quality entirely disappears with cooking, however, and the plant is perfectly harmless, although it is not a general favorite with mushroom-eaters. The following interesting paragraphs are quoted from McIlvaine:

'*L. piperatus* is a readily distinguished species. It is very common. In 1881, after an extensive forest fire in the West Virginia forest, I saw miles of the blackened district made white by a growth of this fungus. It was the phenomenal growth which first attracted my attention to toadstools. I collected it then in quantity and used it, with good results, as a fertilizer on impoverished ground.

'It has been eaten for many years in most countries, yet a few writers continue to warn against it. It is the representative fungus of its class — meaty, coarse, fair flavor. It is edible and is good food when one is hungry and cannot get better. It is best used as an absorbent of gravies.'

LACTARIUS PIPERATUS

LACTARIUS VOLEMUS

THE ORANGE-BROWN LACTARIUS (edible)

Lactarius volemus

Lactarius volemus is a common and widely distributed species which often is quite abundant. It grows in damp woods from July to September, and when one specimen is found others are likely to be found near by. It grows under the same conditions and often along with *Lactarius piperatus*. This plant contains an abundance of white milky juice which flows out rapidly and falls from the plant in drops whenever the cap, gills, or stem are wounded. Unlike the milk of *Lactarius piperatus*, this is not at all bitter, but is quite pleasant to the taste. It becomes quite sticky as it dries.

The cap is 5 to 12 cm. (2 to 5 inches) broad, at first convex, then expanded and plane, or with a slight elevation at the center. Old plants are sometimes depressed at the center. The surface is smooth or wrinkled. The color varies from dull orange to brown. The flesh is white, and quite thick and firm.

The gills are close together, white or sometimes yellowish, and attached squarely to the stem or slightly decurrent on it. The spores are white.

The stem is 3 to 10 cm. (1 to 4 inches) long, solid, hard, and often curved. The stem is colored like the cap, but lighter. There is no ring and no volva.

This mushroom has long been known as an edible one and is considered excellent.

Lactarius indigo is a very pretty plant that is common in some places, especially in sandy regions. It is very easily recognized because the whole plant, including the milky juice, is indigo-blue in color. It is edible.

THE GREEN RUSSULA (edible)

Russula virescens

The green *Russula* occurs on the ground in the woods or sometimes in pastures or clearings that have never been plowed, but always in the vicinity of trees.

The cap is 5 to 10 cm. (2 to 4 inches) broad, at first nearly round, then convex, and finally flat. In old specimens it is often depressed in the middle. It is usually dry, rather thick and firm, but quite brittle so that it is very easily broken. The surface is green — a shade of green that reminds one of green cheese — with more or less regular, somewhat angular patches of a deeper green. The color is usually more pronounced toward the center of the cap, the center often being quite dark green and the color fading out toward the margin, which may be yellowish white. Occasionally specimens are found which have very little of the green color, this being replaced by yellowish white. In mature specimens the margin of the cap is somewhat striate (having radiating lines). The taste of the raw flesh is mild and pleasant.

The gills are white, rather thin and narrow, and crowded. They are nearly free from the stem, though usually not quite. Some of them are forked and others not, and there are usually some shorter ones intermixed with the others. The gills are very brittle, being easily broken to pieces. The spores are white.

The stem is stout and usually shorter than the diameter of the cap. It is smooth, white, and solid at first, but usually becoming spongy. There is no ring and no volva.

This mushroom usually occurs singly, though several may occur very close together. It should be looked for during July and August. It is a great favorite with squirrels and slugs, and the tortoise is said also to appreciate its sweet, nutty flavor. I consider it one of the best and most delicious of edible species.

RUSSULA VIRESCENS

RUSSULA FŒTENTULA

THE SLIGHTLY ILL-SMELLING RUSSULA (not edible)

Russula fœtentula

This mushroom usually occurs in the woods, often among fallen leaves, though I have found occasional specimens under trees on lawns. The specimens from which the accompanying photograph was made were collected among white-oak trees in the 'forestry,' an artificial woodlot on the campus of the University of Illinois.

This species is very easily recognized. The cap is nearly spherical at first, but when fully expanded is flat or somewhat depressed in the middle. It is rather thin, smooth but quite viscid (sticky), and conspicuously striate on the margin. The color is reddish yellow. The odor is like that of bitter almonds, and the taste is slightly bitter. The cap is 4 to 8 cm. (1.5 to 3 inches) broad.

The gills are thin and narrow and quite close together. They are attached to the stem, but sometimes are very nearly free from it, and are whitish in color, but not pure white. The spores are very pale yellow when collected in mass.

The stem is firm and smooth and often hollow. It is white or yellowish white in color, but is usually stained with reddish brown spots at the base. The stem is usually from 2.5 to 5 cm. (1 to 2 inches) long. There is no ring and no volva.

R. fœtentula was described by Dr. Peck in 1906 from specimens collected in New York. It may be looked for from the middle of June until late in August. It usually occurs singly — that is, not in dense clusters — although a considerable number of specimens may be found in a very small area.

An interesting thing about this mushroom is that it forms ectotrophic mycorrhizas (see page 22) on the roots of the white oak. The genus *Russula* contains a large number of species all of which produce their fruit-bodies during the summer, and it is probable that a number of them are capable of producing mycorrhizas. *R. fœtentula*, however, is only the second one of the genus to be definitely reported as a mycorrhiza-former.

This species is not poisonous, but it is not classed as edible because it has not only a disagreeable odor, but a disagreeable taste as well, and would spoil the taste of any other mushrooms with which it might be cooked.

THE DESTROYING ANGEL (poisonous)

Amanita verna

This mushroom is deadly poisonous. It has probably caused more deaths in this country than any other one species and possibly more than all other poisonous species together. This, together with the pure white color of the plant, has won for it the name 'the destroying angel.' The poisonous properties of this plant are discussed on page 32.

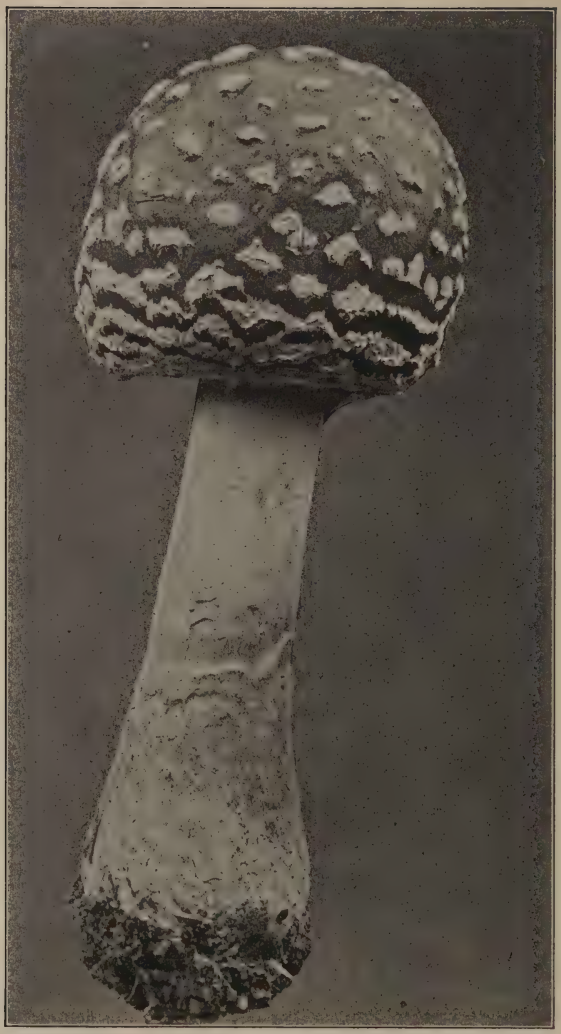
The whole plant is pure white. The cap is smooth, ovate at first and then expanded, and somewhat sticky when moist. It is from 2.5 to 10 cm. (1 to 4 inches) broad. The margin is smooth. The gills are free from the stem. The spores are white and very abundant.

The stem is smooth, often hollow or merely stuffed, and from 5 to 20 cm. (2 to 8 inches) long. It is usually bulbous at the base. The ring forms a broad collar high up on the stem. Nearly mature specimens are often found with the inner veil still stretched from the stem to the margin of the cap, thus completely covering the gills, but eventually it is torn away from the cap and falls loosely about the stem to form the broad collar. The volva is very conspicuous, with a prominent free edge, and hugs the bulbous base of the stem rather closely.

This very attractive-appearing mushroom usually occurs in the woods and sometimes is quite common. It should be very carefully learned and as carefully avoided when collecting mushrooms for the table. It may be found throughout the season from May to November.

Amanita phalloides, also poisonous, is closely related to *A. verna*, and is very much like it except that the cap is dark colored.

AMANITA VERNA



AMANITA MUSCARIA

THE FLY AMANITA (poisonous)

Amanita muscaria

This beautiful but poisonous mushroom is called the fly *Amanita* because the early settlers used it for making 'fly paper.' Although it is deadly poisonous in one sense, it is not quite so dangerous as the 'destroying angel' because the poison in it, muscarin, is well known and atropin is an antidote for it. For a discussion of the poisonous properties of this species see page 33.

The cap of this plant varies from bright yellow to orange or orange-red. It is at first nearly hemispherical and later becomes flat. When young and moist, it is quite sticky. It is from 8 to 20 cm. (3 to 8 inches) broad, and is covered with numerous whitish or pale yellow wartlike scales. The gills are white, free from the stem, and quite close together. They are broad at the outer end and narrower toward the stem. The spores are white.

The stem is 10 to 20 cm. (4 to 8 inches) long, white or tinged yellowish, smooth above the ring, but somewhat scaly below it, and enlarged at the lower end into a bulb. The ring, which is high up on the stem, is large and thick, and white in color. The volva, although it is usually readily seen, is quite different from that of *Amanita verna*. It is usually much torn and surrounds the bulbous lower end of the stem in the form of scales or rings.

Amanita muscaria occurs from July to October, usually in the neighborhood of trees and often on poor gravelly soil. The plants are usually scattered, often quite thickly, but sometimes form fairy rings.

THE BOOTED AMANITA (poisonous)

Amanita cothurnata

The booted *Amanita* is a very pretty plant, and occurs from August to October. It seems to prefer hills and highlands, or mountainous regions.

The cap is fleshy, but quite thin, at first nearly globose, then hemispherical to convex, and finally expanded. When specimens are very old, the margin may be turned up. The cap is usually white, though specimens may be found which are yellowish or tawny olive in the center. It is quite sticky when moist, and is covered with numerous white, cottony scales which may wash off in heavy rains. The margin is finely striate. The pileus is from 5 to 15 cm. (2 to 6 inches) broad.

The gills are free, rounded next to the stem, and quite remote from it. They are always white. The edges of the gills are sometimes eroded or frazzly. The spores are white and very abundant.

The stem is cylindrical, even, and bulbous at the base. The volva is adnate to the bulb, but just above the bulb the stem is margined by a roll of the volva, and this often looks as if it had been sewed at the top like the rolled edge of a garment. The stem is usually hollow even when quite young, and the surface is scaly, or sometimes nearly smooth. The ring is thin and membranous, and is usually a little above the middle of the stem. The stem is 5 to 15 cm. (2 to 6 inches) long.

The plant is very poisonous and sometimes occurs quite abundantly, but with the aid of the photograph, and description here given, there should be no difficulty in distinguishing it from any edible species.

AMANITA COTHURNATA

AMANITA SOLITARIA

THE WARTED AMANITA (poisonous)

Amanita solitaria

Amanita solitaria is a very variable species which is widely distributed. It often occurs solitary, as its name implies, though not always. It grows sometimes in open woods, sometimes in grassy places, and the specimens from which the accompanying photograph was made grew on bare sand in the southeastern part of Kankakee County, Illinois. The forms which occur in these various habitats are so different that they have often been described as different species, but they all agree in having the stem elongated below into a rootlike base and in being more or less scaly.

The cap when fully expanded is 5 to 15 cm. (2 to 6 inches) broad. In the button stage it is nearly spherical, and as it opens up it becomes hemispherical, then convex, and finally nearly flat. It is usually white or nearly so. The surface is always somewhat scaly and may be very much so. The scales are sometimes large and pointed and close together, so that the cap resembles a pine cone. These large scales rub off easily and stick to the hands when the plant is handled or they may be washed off by rains. In other plants the scales are smaller, and in some cases are reduced to mere granules or to flat patches. The flesh is white and has rather a strong odor.

The gills are white, free from the stem or attached to it by the upper angle, rather narrow, and quite close together. The spores are white.

The stem is 5 to 20 cm. (2 to 8 inches) long, sometimes enlarged toward the base, and usually rooting deep in the soil. The surface of the stem may be smooth or mealy, or scaly like the cap.

The ring is white. It is near the top of the stem and is quite fragile so that it is often much torn. Sometimes the inner veil, instead of forming a ring, is torn off from the stem and clings to the margin of the cap, or it may disappear entirely.

The volva is white and fragile so that it often breaks up and disappears.

Amanita solitaria has been reported as edible by a number of authors, but a small quantity of the deadly *Amanita* toxin, the same poison that is present in *Amanita verna*, has been found in this plant. For this reason it should by all means be classed as poisonous and should never be eaten.

THE YELLOW AMANITA (poisonous)

Amanita flavoconia

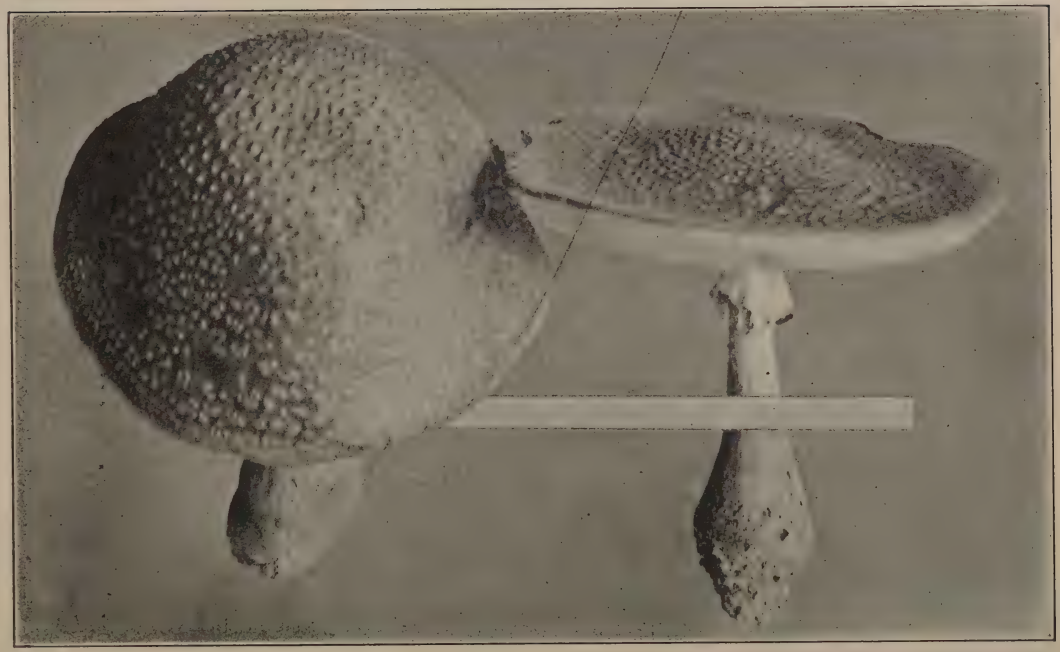
Amanita flavoconia is a widely distributed mushroom and is often the commonest species of *Amanita.* It grows in the woods as solitary or scattered individuals from July to September.

The cap is 3 to 10 cm. (1 to 4 inches) broad, quite sticky except when very dry, and varying in color from pale yellow to orange yellow. It usually has numerous yellow, patchlike scales. These, however, are easily rubbed off or washed off by rain, so that often caps are found that are entirely without scales. The flesh is rather thin and white. The gills are white, free from the stem, close together, and of medium width. The spores are white.

The stem is 4 to 12 cm. (1.5 to 5 inches) long, whitish, but often covered with yellowish scales below the ring, yellow above the ring, usually somewhat bulbous at the base. The ring is membranous, yellow in color, and placed high up on the stem. The volva is very fragile and appears as yellow powdery patches on the bulb of the stem. The most of it usually remains in the soil when the plant is dug up.

This mushroom seems to be rather closely related to the fly *Amanita* and probably contains the same kind of poison.

AMANITA FLAVOCONIA



AMANITA RUBESCENS

THE REDDISH AMANITA (not edible)

Amanita rubescens

Amanita rubescens grows in open or pastured woods and sometimes in parks. It occurs mostly in July, but sometimes as late as September. It is characterized by its dull reddish color, and especially by the fact that when it is wounded the interior part that is exposed to the air quickly becomes reddish in color.

The cap is 5 to 12 cm. (2 to 5 inches) broad, at first oval and not becoming fully expanded until quite old. It is slightly sticky when moist and pale reddish to reddish brown in color. It is covered with soft, wartlike scales which vary from white or gray to red. The flesh is white, but becomes red in old plants, or if exposed to the air. The gills are white, rather close together, and extend clear to the stem, but are free from it. The spores are white.

The stem is 8 to 20 cm. (3 to 8 inches) long, bulbous at the base, and nearly smooth. It is tinged pink on the outside and also within, and becomes red when bruised or wounded. The ring is broad, membranous, and placed well up on the stem. The volva is almost entirely lacking, though sometimes fragments may be found sticking to the bulb or to the soil around the bulb.

This mushroom is said to be edible and probably it is, but I have labeled it 'not edible' because I do not think it advisable to eat any *Amanitas*. There are plenty of good mushrooms to eat without taking the risk that is necessarily involved in eating species of *Amanita*.

THE SHEATHED AMANITOPSIS (edible)

Amanitopsis vaginata

This mushroom occurs in the woods or in groves under trees, and is quite common. Occasionally it occurs in open pastures or stubblefields. It is edible, but there is a very poisonous species of *Amanita*, *Amanita spreta*, which looks very much like this mushroom, except that the *Amanita* has a ring on the stem and the *Amanitopsis* has not. For this reason no one should eat *Amanitopsis vaginata* until he is very thoroughly familiar with it, especially since the ring of *Amanita spreta* occasionally is lost, in which case the plant looks very much like *Amanitopsis*.

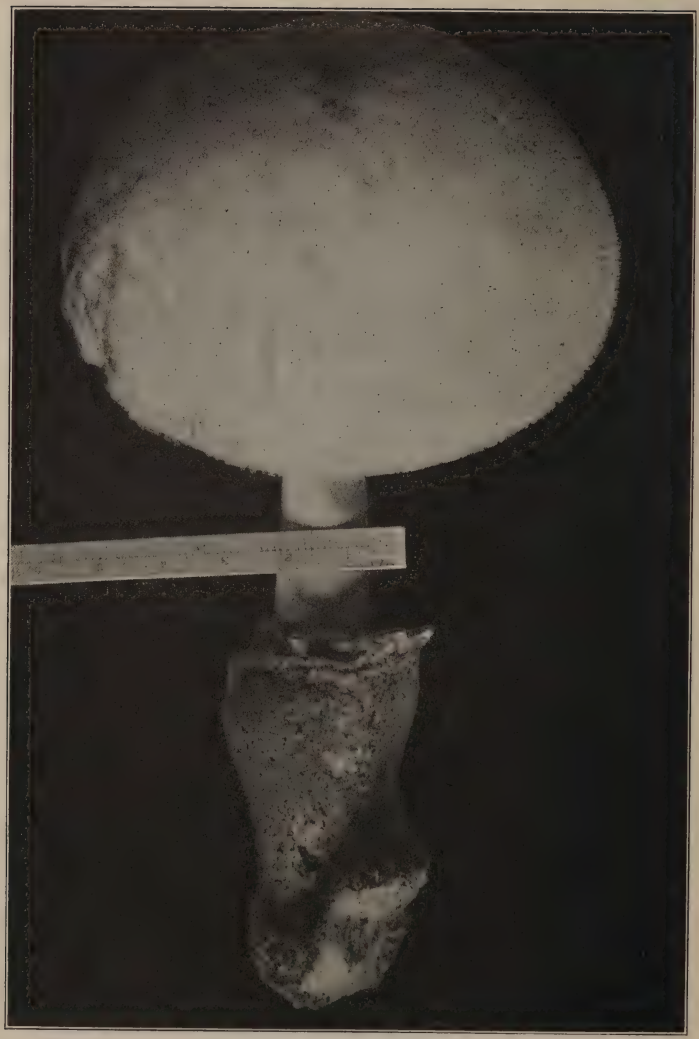
The cap of *Amanitopsis vaginata* is from 3 to 8 cm. (1 to 3 inches) broad, at first bell-shaped, but it finally expands until it is nearly flat. The margin is thin and deeply striate; that is, it is marked by conspicuous furrows and ridges. The color of the surface may be gray, mouse-color, brown, yellowish, or white, but the flesh is always white.

The gills are white or whitish and free from the stem, and the spores are white.

The stem is cylindrical, tapering upward somewhat, but not bulbous at the base, and is from 8 to 15 cm. (3 to 6 inches) long. The stem may be smooth or covered with small scales or downy particles. Sometimes in dry weather the outer layer of the stem splits in such a way as to form large scales. The stem is either hollow or stuffed with a cottony pith. There is no ring. The volva is thin and fragile, but prominent. It forms a large close sheath about the cylindrical base of the stem, but is free from the stem except at the lower portion. If the plant is pulled up instead of being dug, the volva is very likely to be pulled off and remain in the ground, in which case the plant might easily be mistaken for some mushroom which lacks a volva.

Amanitopsis vaginata is a very pretty plant and some mushroom-eaters are very fond of it. The whole plant is very fragile and brittle, and the flesh is thin, and since there is some danger of mistaking it for poisonous species of *Amanita* I do not recommend it. It may be found from June to November.

AMANITOPSIS VAGINATA



VOLVARIA BOMBYCINA

THE SILKY VOLVARIA (edible)

Volvaria bombycina

This beautiful mushroom is likely to be found in any locality, although usually not many specimens are found at a time. It grows on decaying wood of logs, stumps, wounded trees, etc. It occurs most frequently on maple and box-elder, but occasionally it is found on oak, beech, and other trees. It may be looked for from June to October, but it is more likely to be found during the latter part of this period. This is a very large and very attractive mushroom, occurring usually only one in a place, but sometimes two or more growing close together.

The cap is from 5 to 20 cm. (2 to 8 inches) broad, at first globose, then bell-shaped, and finally convex. It is a beautiful white color, and the entire surface is covered with numerous silky hairs which stand out in the form of soft down. In older specimens the surface may become more or less scaly and may finally become smooth at the apex. The flesh is white and not very thick.

The gills are free from the stem, crowded close together, very broad along the middle, and flesh-colored. They are often toothed or ragged along the edge and do not extend quite to the margin of the cap. The spores are rosy pink in mass.

The stem is 7 to 15 cm. (3 to 6 inches) long, white in color, solid and smooth, and tapers evenly from the base to the top. When the mushroom grows on the top of a log, the stem is straight, but if it grows on the side of a stump or tree-trunk, the stem curves in such a way as to bring the cap into a horizontal position.

There is no ring, but there is a volva. In this respect the genus *Volvaria* corresponds with the genus *Amanitopsis*, but it differs from that genus in the color of the spores. The volva is very large and thick and is usually somewhat sticky. The genus name *Volvaria*, which means a wrapper, was originally given to this plant because of the large baglike volva.

THE SMOOTH VOLVARIA (not edible)

Volvaria speciosa

This mushroom is very common in California. It is also common in some places in Europe. In the eastern half of the United States it is not so common, but is found frequently. It grows where there is an abundance of decaying organic matter such as leaf-mold in woods, richly manured soil in fields, etc. I have several times found it growing on piles of decaying cornstalks at the edge of a field. It may be looked for from May to July.

The cap is 3 to 10 cm. (1 to 4 inches) broad, white, smooth, but very viscid (sticky). The flesh is rather thin and soft. The gills are rather broad, close together, and free from the stem. They are at first white, but become flesh-colored or rosy as the spores ripen. The spores are pink.

The stem is 10 to 20 cm. (4 to 8 inches) long, white, nearly cylindrical, and smooth except at the base, where there are usually some short white hairs. The volva is rather large, but thin and close-fitting, and often torn around the edges. There is no ring. Old plants sometimes have a strong and disagreeable odor.

In Europe this mushroom is considered poisonous, while in California it is eaten and is considered perfectly safe. In the Eastern States it has not been sufficiently tested, and therefore for the present it should be classed as not edible.

VOLVARIA SPECIOSA

LEPIOTA MORGANI

THE GREEN-SPORED MUSHROOM (poisonous)

Lepiota Morgani

This is one of the largest and handsomest of mushrooms. It occurs in pastures and other open grassy places or in gardens, and is sometimes quite abundant. It may be looked for from June to October, and will be found very easy to recognize. It often forms well-marked fairy rings a rod or more in diameter.

The cap is from 10 to 30 cm. (4 to 12 inches) broad, rather soft and fleshy, nearly globose at first, then expanded, and sometimes depressed in the middle. The predominant color of the cap is white, but it is covered by a brownish cuticle which breaks up into scales except at the center. The flesh of both the cap and the stem is white, but when it is cut or bruised it changes to reddish and then to yellowish.

The gills are close together, quite broad, and entirely free from the stem. They are at first white, but when mature they are green. The spores are green when they are first shed, but after exposure to the light for some time they gradually become yellow.

The stem is firm, cylindrical, but more or less bulbous at the base, or sometimes tapering slightly upward, and smooth. It is whitish, but tinged with brown, and is from 15 to 20 cm. (6 to 8 inches) long. The ring is rather large and conspicuous and is usually movable on the stem. There is no volva.

This plant is not closely related to any other *Lepiotas*. It merely happened to be placed in this genus because there is no green-spored group, and therefore no place for it. It is perhaps unfortunate that it was placed here, for it has given a bad reputation to a really very dependable genus. Many people are afraid to eat any *Lepiotas* because they have heard that *Lepiota Morgani* is poisonous, but, in truth, there are no common species of *Lepiota* other than this one that are perfectly safe, and the only shadow upon the good name of the genus has been cast by this green-spores mushroom which probably ought not to be in this genus at all.

It is said that some persons can eat *Lepiota Morgani* with perfect safety, but since it is poisonous to some it should be carefully avoided.

THE PARASOL MUSHROOM (edible)

Lepiota procera

The parasol mushroom is a tall, stately, and very beautiful plant. It grows singly or scattered on the ground in pastures, meadows, open woods, or other grassy places. Sometimes it is even found on lawns or in gardens and often along roadsides. It is a late summer mushroom, being found from August to October.

The cap is from 5 to 15 cm. (2 to 6 inches) broad, rather elliptical or oval in shape before expanding, but becomes bell-shaped, and finally almost flat, except that there is usually a hump (umbo), at the center. The cap is at first covered with a grayish-brown or reddish-brown cuticle, and as the cap expands this cuticle breaks up into rather shaggy scales exposing the white flesh except on the umbo at the center. The flesh is white, but becomes reddish as it gets old or whenever cut or bruised. It is not very thick. The gills are close together, rather broad at the outer end and narrower toward the stem end. They are white in color and entirely free from the stem. The spores are white.

The stem is from 12 to 30 cm. (5 to 12 inches) long, cylindrical, but usually enlarged at the base into a prominent bulb. It is rather slender in proportion to its length, being usually less than one half inch thick. The color is nearly the same as that of the cap, and the surface frequently cracks up into scales in much the same way as does the surface of the cap. The ring is thick and stout, and is usually movable on the stem. There is no volva.

This is one of the tallest of our mushrooms. It is found in nearly every part of the world and is a most delicious edible plant. It is very highly prized by those who are familiar with it.

LEPIOTA PROCERA

LEPIOTA CRISTATA

THE CRESTED LEPIOTA (edible)

Lepiota cristata

The crested *Lepiota* is a small plant, but it is common and often occurs very abundantly. It is found in the woods under trees, usually among dead leaves, and is often especially abundant along the borders of woods and in other grassy but somewhat shaded places. It occurs either in clusters or scattered, and may be looked for from May to September.

The pileus is somewhat fleshy, but rather thin, at first bell-shaped or convex, then expanded and nearly plane. The surface is at first entirely dull reddish or reddish brown, but the cuticle soon breaks up into reddish or reddish-brown scales, and the background of the surface is then white. The scales are often arranged in a concentric manner. They are far apart at the margin and progressively more numerous toward the center. The center of the cap remains smooth and uniformly reddish brown, because it does not expand so much at this point and therefore does not crack. This gives the cap a crested appearance. The cap is from 1.5 to 4 cm. (0.5 to 1.5 inches) broad.

The gills are white, and free from the stem, but quite close to it. They are narrow and crowded close together. The spores are white.

The stem is whitish, slender, cylindrical, and hollow. It is usually smooth, but sometimes has silky fibers on it, and is from 2.5 to 5 cm. (1 to 2 inches) long. The ring is small and white and sometimes breaks up and disappears. There is no volva. The white mycelium is often quite conspicuous and may be traced for three inches or more from the base of the stem.

This plant has a rather strong odor which is somewhat offensive, but when cooked it is of good consistency and is sweet and pleasing to the taste. Although it is a very small mushroom, when it can be found in abundance it is well worth collecting.

THE GRAINY LEPIOTA (edible)

Lepiota granulosa

This is a small mushroom which occurs abundantly in the woods and in waste places during damp, warm weather from August to October.

The cap is 1.5 to 6 cm. (0.5 to 2.5 inches) broad, at first convex, but becoming nearly plane, and sometimes has a slight elevation in the middle. The surface of the cap is made rough by numerous granular or branlike scales, and is often radiately wrinkled. The color is rusty yellow or reddish brown, but becomes paler with age. The flesh is white or sometimes tinged with red.

The gills are close together, rounded at the end next to the stem, medium in width, and white. They are nearly free from the stem, but usually appear slightly attached to it, differing in this respect from most *Lepiotas* since it is characteristic of the genus to have the gills entirely free from the stem. The spores are white.

The stem is 2.5 to 6 cm. (1 to 2.5 inches) long, cylindrical, or sometimes slightly thickened at the base. It is smooth and white above the ring, but below the ring it is colored and covered with granular scales like the cap. The ring is very slight, being little more than the abrupt termination of the scaly covering of the stem, and sometimes it disappears entirely. There is no volva.

There is a variety of this plant which is pure white at first, later partly turning red, and when dried becoming entirely red-tinged. There is also a variety which persistently remains pure white.

Although this is a small species, a considerable number of individuals are often found on a small area, and since they are quite fleshy for their size and are of pleasing quality, they are well worth collecting when they can be found in any abundance. It is best to remove the stem and use only the caps.

LEPIOTA GRANULOSA

LEPIOTA NAUCINA

THE SMOOTH LEPIOTA (edible)

Lepiota naucina

This beautiful and excellent mushroom occurs in grassy places such as pastures, along roadsides, and sometimes on lawns, from June to November, but is usually most abundant during the latter part of the summer. In some years it is extremely abundant, while in others it is rather scarce. I have seen acres of ground white with it where for several years previously only occasional specimens had been found. Many people are afraid of this mushroom because of its minor resemblances to some of the poisonous *Amanitas*, but when one once becomes familiar with the characters and appearance of the plant there is no reason for making a mistake in collecting it.

The cap is soft, but very fleshy and thick. It is at first globose, then expanded and nearly flat or with a blunt umbo or elevation in the center. The surface is smooth and snowy white or smoky white, and the flesh is thick and white. The cap is 5 to 10 cm. (2 to 4 inches) broad and usually very regular in shape.

The gills are somewhat crowded and entirely free from the stem. They are pure white or sometimes pinkish brown in very old specimens. The spores are white as a rule, but sometimes pale pink.

The stem is white, smooth, or with fine fibers on its surface, enlarged at the base and tapering somewhat upward. It is from 5 to 10 cm. (2 to 4 inches) long. The ring is rather thin and delicate, but distinct and conspicuous. It is sometimes lost in old specimens, but usually some remnants of it can be found. There is no volva.

This mushroom can be used in any way in which the common cultivated mushroom is used and will be found just as good. It probably could be cultivated for market just as profitably as is *Agaricus campestris*, and its appearance is even more inviting. Its taste even when uncooked is mild and pleasant. The surface of the cap has a sort of kid-leather texture which is unmistakable when one once becomes familiar with it. Nevertheless, it must be remembered that *Lepiota naucina* resembles in some respects the deadly *Amanita*, and one cannot exercise too great care in collecting and using only specimens that can be identified with absolute certainty.

THE RED-TINGED LEPIOTA (edible)

Lepiota rubrotincta

This medium-sized plant is quite common in some places. It is found scattered on the ground in woods from July to October.

The cap is 1.5 to 5 cm. (0.5 to 2 inches) broad, at first oval in shape, but soon becoming nearly flat with a slight elevation at the center. The color of the upper surface is at first uniformly reddish pink, but as the cap expands the surface cracks radially so that streaks of white show through the pink. The flesh is white and not very thick. The gills are white, free from the stem, rather narrow, and medium close together. The spores are white.

The stem is usually from 2.5 to 7.5 cm. (1 to 3 inches) long and rather slender. It is smooth or sometimes slightly silky, and nearly cylindrical or tapering somewhat from the base upward. The ring is well developed, rather thick, and not movable on the stem. Its edge is usually tinged with red or pink.

This is a very pretty plant which is easily identified, and when it can be collected in sufficient quantities it will be found to compare favorably with other *Lepiotas* in its edible qualities.

Lepiota americana is another red *Lepiota*. It is somewhat larger and stouter than *Lepiota rubrotincta*, and the red surface of the cap, instead of splitting radially, breaks up into scales. The white flesh becomes reddish as it gets old or whenever cut or bruised. It is edible.

LEPIOTA RUBROTINCTA

AGARICUS CAMPESTRIS

THE PASTURE MUSHROOM (edible)

Agaricus campestris

Agaricus campestris is the common 'pink-gill mushroom' that is always obtainable in the market either fresh or in cans. Some people call this a mushroom and all others toadstools, erroneously thinking that this is the only one that is good to eat. It is produced in cultivation in great quantities not only in this country, but in several others, especially France, Japan, and China. It is said that as many as seventy-five tons are annually produced in Chicago alone.

This mushroom occurs wild also, and is probably more widely known and collected for food than any other. It grows in fields and pastures and in lawns and along roadsides from July to October.

The cap is 4 to 12 cm. (1.5 to 5 inches) broad, at first somewhat globular, then round-convex, and finally expanded and nearly flat. The surface is at first nearly smooth, but has a soft silky appearance because of numerous loose fibers. As the mushroom becomes older, the surface sometimes becomes more or less scaly. The color varies from white to creamy white or light brown. The flesh is white. The margin of the cap extends somewhat beyond the ends of the gills.

The gills are close together, free from the stem, and rounded at the inner end. They are for some time hidden by the inner veil. When they are first revealed by the separation of the veil, they are pink in color, but as the spores mature the gills gradually become purple-brown or blackish brown. The spores are dark brown or nearly black with a purple tinge.

The stem is 3 to 10 cm. (1 to 4 inches) long, nearly cylindrical or tapering somewhat toward the lower end, and white or whitish in color. The inner veil from which the ring is formed is white, silky, and very thin and frail. Often a part of it remains as fragments on the edge of the cap, while the ring which is formed from it on the stem is so frail that it shrivels as the mushroom matures and sometimes disappears entirely. There is no volva.

Although these mushrooms can be purchased in the market at any time at from one dollar to one dollar and a half a pound, any one who will take the trouble to learn the distinguishing characteristics of this and a few other species can keep his table supplied throughout the growing season at a cost only of the time it takes to collect them.

THE FLAT-CAP MUSHROOM (edible)

Agaricus placomyces

Agaricus placomyces occurs in lawns, parks, and the borders of woods from June to September. It is sometimes said to be associated with hemlock trees, but I find it abundantly in central Illinois where hemlock does not occur, and indeed sometimes it is not associated with any kind of tree, being found in open grassy places.

The cap is 5 to 12 cm. (2 to 5 inches) broad and rather thin. It is at first broadly ovate, then convex, and finally, when fully expanded, it is quite flat. In young specimens the surface is quite uniform brown in color, but as the cap expands the surface layer breaks up into numerous small brown scales and the ground-color then becomes white or yellowish white except at the center, where there is always a circular patch that is nearly smooth and uniformly brown.

The gills are close together and free from the stem. They are at first white, but very soon become pink, and when old they are blackish brown. The spores are blackish brown with a tinge of purple.

The stem is 5 to 15 cm. (2 to 6 inches) long, rather slender, sometimes hollow, and somewhat bulbous at the base. It is white or whitish, but the bulb is sometimes tinged with yellow. The inner veil is quite interesting. It is double, that is, it consists of two layers, loosely joined together by threads. In young specimens it is found stretched from the margin of the cap to the stem. As the cap expands, the lower layer is usually torn into quite regular radiating portions. Later the upper portion is torn loose from the cap and the whole forms a broad ring on the stem. There is no volva.

This is a very pretty mushroom, and while the caps are rather thin they are of excellent flavor and can be used in any way in which the cultivated mushroom is used.

AGARICUS PLACOMYCES

AGARICUS ARVENSIS

THE HORSE MUSHROOM (edible)

Agaricus arvensis

The horse mushroom occurs in fields or pastures, or under trees on lawns, or in the borders of woods.

The cap is smooth and dry, the surface sometimes more or less cracked in age, white or sometimes slightly yellowish, convex or conical, bell-shaped, and finally expanded. It is 5 to 15 cm. (2 to 6 inches) broad. It is usually quite thick and firm.

The gills are much crowded, free from the stem, and usually broader toward the stem. When very young they are whitish, but as the spores mature they become pinkish and finally blackish brown. The spores are dark purple-brown when viewed in mass.

The stem is stout, nearly cylindrical or somewhat thickened at the base, smooth, hollow or stuffed, and 5 to 12 cm. (2 to 5 inches) long.

The ring is rather large and thick and is double; that is, it consists of two parts, the upper part being membranous, and the lower part much thicker, often yellowish, and usually split radially so that it remains as patches on the lower surface of the upper membrane. In this respect the horse mushroom resembles *A. silvicola* and *A. placomyces*, to both of which it is closely related.

When the stem is first cut there often exudes from the wound a yellowish liquid, and the whole plant usually becomes yellowish when dried.

This plant grows much larger than *Agaricus campestris*, and will be found delicious if used in any way in which that mushroom is used. It may be looked for from July to September. It sometimes occurs in large fairy rings, and sometimes is found in considerable quantities. Even if only a few specimens are found, they may be utilized very well by frying the caps quickly in a liberal supply of butter and serving on pieces of hot buttered toast.

Like many other mushrooms, *Agaricus arvensis* often seems to be partial to the vicinity of trees, though no mycorrhizal or other connection with the trees has yet been demonstrated.

THE SYLVAN MUSHROOM (edible)

Agaricus silvicola

Agaricus silvicola is a pretty and interesting mushroom which is very closely related to *Agaricus arvensis*, but it is not found in similar places. It occurs mostly in the woods, though it is said to occur sometimes in groves or under trees near woods. It may be looked for from July to October.

The cap is 5 to 15 cm. (2 to 6 inches) broad. It is convex and then expanded and nearly flat, but often with a broad elevation or umbo at the center. It is rather thin and brittle, but quite fleshy. The surface is smooth and shining white, but sometimes tinged with yellow, and occasionally with a tinge of pink at the center. The flesh is whitish or tinged with pink.

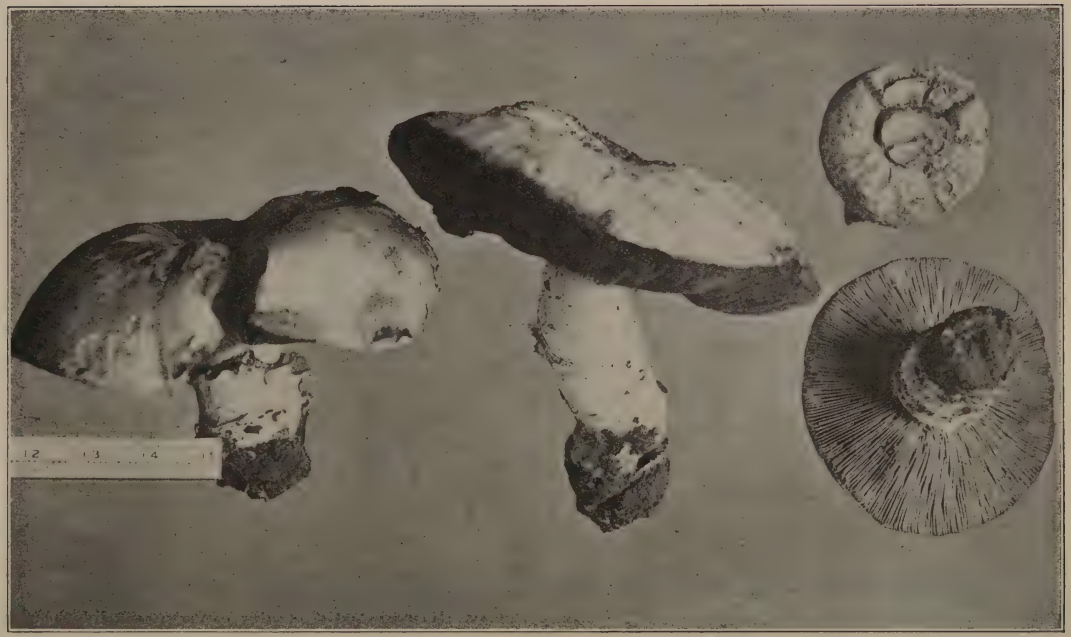
The gills are close together, thin, tapering somewhat toward each end, entirely free from the stem and quite distant from it. The end toward the stem is somewhat rounded. The gills are at first white, but they very soon become pink and then blackish brown.

The stem is rather slender in comparison with the size of the cap and ranges from 5 to 20 cm. (4 to 8 inches) in length. It is smooth and white, except that it is often yellowish at the lower end and often becomes stained with yellow when dried. The stem is nearly cylindrical, but is rather abruptly enlarged at the base into a bulb. The ring is usually thin, delicate and membranous, though sometimes it is thicker, and is easily torn, but it is broad and conspicuous and sometimes double like that of *A. arvensis* and *A. placomyces*. It is either whitish or yellowish. There is no volva.

This is a very graceful and attractive plant. It is intimately associated with trees, although no mycorrhizal or other connection with the trees has been discovered. It sometimes forms very perfect fairy rings. I have seen rings of this mushroom fifteen feet or more in diameter extending around a tree in the woods, with the tree nearly at the center.

The taste of *A. silvicola* is high-flavored and spicy. It is an excellent mushroom to cook with meat and is said to be one of the best for making catsup. For those who prefer strong flavors in mushrooms, it will improve a dish of any mild-flavored species with which it is mixed.

AGARICUS SILVICOLA



AGARICUS RODMANI

RODMAN'S MUSHROOM (edible)

Agaricus Rodmani

Agaricus Rodmani is a very interesting mushroom because of its peculiar choice of a place to grow. It occurs often along the streets of cities, usually between the curbing and the walk or outside of the curbing if the street is not paved. I have found it in perfectly bare hard soil just outside of the wagon track on an unpaved street. More frequently, however, it is found in grassy places. It is usually found during May and June, though occasionally it occurs also in autumn.

The cap is at first rounded, then convex, and finally nearly plane. It is very firm and compact, thick, and heavy. The surface is smooth, or sometimes slightly cracked at the center, and white. Occasionally it becomes yellowish at the center. The flesh is white. The cap is 5 to 10 cm. (2 to 4 inches) broad.

The gills are close together and narrower than in most species of *Agaricus*. They are free from the stem, but reach clear to it and are rounded at that end. When very young they are white, but they soon become pink or reddish pink, and when old are blackish brown. The spores are dark purple-brown.

The stem is short, 2 to 6 cm. (1 to 2.5 inches). It is solid, nearly cylindrical, and not at all bulbous. Below the ring it is smooth and white, but above the ring it is often scurfy or covered with mealy scales.

The ring is very peculiar and characteristic. It is very thick and so completely double that it appears as two distinct rings on the stem. This is probably due to the fact that the very thick veil is at first attached to both the inner and outer surfaces of the edge of the cap and when it is broken loose from the cap it remains as a double ring on the stem. There is no volva.

The flesh of this mushroom is very firm and meaty, but it is crisp and not at all tough and its flavor is very agreeable. It is highly prized by some people who are familiar with its qualities.

THE SLIGHTLY RED MUSHROOM (edible)

Agaricus subrufescens

This is one of the prettiest of the large mushrooms. It occurs in woods and groves from June to September. It is said to occur also in greenhouses. According to Dr. McIlvaine it is an easy species to cultivate and has a number of advantages over *Agaricus campestris* for that purpose. It is very productive and keeps very well.

The cap is 7 to 12 cm. (3 to 5 inches) broad, at first nearly hemispherical, and a single specimen growing alone is usually very perfect and regular in shape. The plant also occurs in clusters, however, and in that case the caps are somewhat irregular from mutual pressure. Later, as the cap expands, it becomes convex or somewhat flattened. The surface is covered with numerous silky hairs and minute scales. The color is light reddish brown. At the center the surface is usually smooth and a little darker in color. The flesh is white and has a flavor like that of almonds.

The gills are at first white, then pink, and finally blackish brown. They are entirely free from the stem.

The stem is 7 to 12 cm. (3 to 5 inches) long, white, and nearly cylindrical, but usually somewhat bulbous at the base. The stem is whitish, and somewhat scaly below the ring. The ring is thick and conspicuous, and scaly on the under side. There is no volva. The mycelium is white and often forms long rootlike branches extending into the soil from the lower end of the stem. This is considered an excellent edible species.

AGARICUS SUBRUFESCENS

COPRINUS COMATUS

THE SHAGGY-MANE MUSHROOM (edible)

Coprinus comatus

The shaggy-mane mushroom is a handsome plant which can scarcely be mistaken for anything else when one has once seen it. In fact the photograph alone is enough to identify it. It occurs in lawns, parks, and other grassy places, especially if the soil is richly manured. It grows either singly or in clusters, and may be looked for in wet, warm weather from May to late autumn. The fruit-bodies grow very rapidly, so that one is likely to find a basketful waiting for him to collect them for breakfast some morning in a place where there was not a sign of any the night before.

The cap is 5 to 15 cm. (2 to 6 inches) broad, soft-fleshy, moist, at first oblong or cylindrical and then bell-shaped, but seldom expanded. As it matures it usually splits at the margin along the lines of the gills. In very young specimens the surface is spotted with dark brown and white, due to the fact that the outer layer, which is dark brown, is torn and separated into patches or scales so that the white beneath shows between them. As the cap elongates, the brown patches become farther and farther apart, so that the mature plant is nearly all white.

The gills are broad, free from the stem, and crowded close together. They are at first white, but when the spores begin to ripen the gills become dark, then black, and finally they dissolve into an inky fluid which falls from the cap in drops. The spores are black.

The stem is sometimes very short, but may be as much as 25 cm. (10 inches) long, the upper portion being concealed within the cap. It is nearly cylindrical, but usually tapers slightly upward, and is sometimes bulbous at the base. It is hollow, brittle, smooth or with some loose fibers on the surface, white or nearly so, and very easily pulled out of the cap. The ring is thin and usually movable. In mature plants it is apt to be found lying on the ground at the base of the stem or it may have disappeared altogether. There is no volva.

This is a most excellent edible species. Many people consider it much better than the cultivated mushroom. It is one of the best for stewing or for cooking with meat.

THE INKY-CAP MUSHROOM (edible)

Coprinus atramentarius

The inky-cap is not so pretty as the shaggy-mane, but it occurs under much the same conditions in lawns, parks, and other grassy places, especially if the soil has been richly manured. It grows either singly or in clusters, sometimes only two or three in a cluster, but more often ten to twenty or more. The growth of a large cluster of these mushrooms exhibits considerable force, and will lift a very firmly sodded soil.

The cap is 3 to 11 cm. (1 to 4 inches) broad. It is at first egg-shaped or oval, but it becomes expanded as it melts away into an inky fluid. The cap is soft and very tender and the surface is either smooth or scaly. The margin is usually more or less conspicuously ribbed and often is irregularly notched. The color varies from silvery gray to smoky brown.

The gills are broad and very close together. They are at first creamy white, then pinkish gray, and finally they become black and dissolve into an inky fluid. This melting away of the gills has been shown to be necessary for the liberation of the spores. The spores are black.

The stem is rather slender, 5 to 12 cm. (2 to 5 inches) long, hollow, smooth, and tapers somewhat upward. It separates from the cap very easily. The ring is rather slight, consisting only of an irregular elevation of threads near the base of the stem. Often it is washed off by rains and disappears altogether.

Although this mushroom is not so attractive as the shaggy-mane, it is more highly flavored and is considered an excellent species for stewing. Like all species of the genus *Coprinus*, it is very easily digested. It should be cooked as soon as gathered, for its keeping qualities are very poor. It may be looked for after rains from May until late in the autumn.

COPRINUS ATRAMENTARIUS

COPRINUS MICACEUS

THE MICA-CAP MUSHROOM (edible)

Coprinus micaceus

Coprinus micaceus may be found during wet weather from early spring until frost. It occurs at the bases of trees, stumps, posts, etc., or in grassy places where dead roots or sticks are buried in the soil. It is very common, and it is often possible to collect a basketful while walking around a city block. It usually grows in dense clusters with from ten to as many as a hundred or more in a cluster, though sometimes the plants are scattered on lawns or other grassy places.

The cap is 2 to 5 cm. (1 to 2 inches) in diameter and rather thin. It is at first ovate, then bell-shaped, and if the weather is not too damp it may become expanded, but in wet weather it is apt to dissolve into an inky fluid before becoming fully expanded. It is yellowish brown or tan in color, and the surface is marked by prominent striations extending from near the center to the margin. In young specimens the surface also bears numerous small shining scales which glisten in the light like particles of mica, and because of which the species name *micaceus* is given to the plant. In older specimens these scales are apt to disappear entirely.

The gills are narrow, crowded close together, and free from the stem. They are at first whitish, then darker, and finally black. In damp weather they dissolve into an inky fluid, but in dry weather they often remain intact and become dry. The spores are black or sometimes dark brown.

The stem is 3 to 10 cm. (1 to 4 inches) long, rather slender, and fragile and hollow. It is nearly cylindrical in shape and smooth or somewhat silky on the surface. The ring is of the same type as that of *Coprinus atramentarius*, but it is very delicate and easily lost, so that it is seldom seen except in very young specimens that have not been washed by rains. There is no volva.

All species of the genus *Coprinus* are very easily digestible, and the glistening *Coprinus* has been said to be the most easily digestible mushroom that grows.

THE SPOTTED COPRINUS (edible)

Coprinus ebulbosus

This handsome plant occurs in the woods on and around decaying stumps and logs from May to October. It grows in large clusters, and its numerous spotted caps give it a very striking appearance when one comes upon it suddenly on stepping over a rotten log or passing around a decaying stump. It is a common mushroom and often is very abundant.

The cap is 2 to 7 cm. (1 to 3 inches) broad, at first ovate, then bell-shaped, and sometimes expanded, but it usually dissolves into an inky fluid. It is fleshy, but rather thin and fragile. In very young specimens the surface is uniformly brownish or straw-color, but the outer layer very soon breaks up into large irregular scales or patches, exposing the smooth white surface of the cap and giving it the spotted appearance.

The gills are broad, crowded close together, and free from the stem. They are at first white or bluish white, then brown, and finally black, soon dissolving into an inky fluid. The spores are black.

The stem is 7 to 12 cm. (3 to 5 inches) long, nearly cylindrical, or tapering slightly upward. It is hollow and brittle, smooth or nearly so, and white on the surface, and usually has white branching strands of mycelium extending from the base. The ring is slight like that of *Coprinus atramentarius*, to which this species is closely related. There is no volva.

Coprinus ebulbosus is perhaps not quite so good as *C. atramentarius*, but it is very good and well worth collecting. All *Coprini* will be found very good if prepared in the same way as oysters for frying.

COPRINUS EBULBOSUS

PLUTEUS CERVINUS

THE FAWN-COLORED PLUTEUS (edible)

Pluteus cervinus

Pluteus cervinus is a very common and widely distributed mushroom which occurs from early spring until late autumn. It occurs on logs, stumps, etc., and also on the ground where roots or decaying wood is buried. Often successive crops are found in the same place week after week throughout the growing season. The plant occurs also on old sawdust piles.

The cap is 5 to 15 cm. (2 to 6 inches) broad, at first bell-shaped, then convex, and finally nearly flat. It is fleshy, but quite fragile. The color and character of the surface are very variable. It is usually smooth or with only a few loose fibers, but sometimes the central portion is covered with minute hairs. In wet weather the surface is often somewhat sticky. The color varies from light brown to blackish brown, but occasionally specimens are found that are yellowish or even white. The flesh is white.

The gills are broad, close together but not greatly crowded, and free from the stem. They are at first white but become flesh-colored or pink as the spores mature. The spores are light pink.

The stem is 7 to 12 cm. (3 to 6 inches) long, solid, and firm, but rather brittle, and tapers slightly upward. It is usually white, with dark fibers or streaks on the surface, but sometimes it is colored like the cap. The stem is very easily removed from the cap. There is no ring and no volva. When the plant grows from the side of a stump or log, the stem is apt to be curved in such a way as to bring the cap into a horizontal position.

Pluteus cervinus is one of the earliest of the larger mushrooms and is also one of the best. Fried in butter and served hot on toast, it is delicious.

THE YELLOW PLUTEUS (edible)

Pluteus admirabilis

This pretty little mushroom is found scattered on decaying logs and stumps in the woods from July to October. It is easily recognized by its size and color, the whole plant being yellow.

The cap is 1 to 4 cm. (0.5 to 1.5 inches) broad, at first convex, but later nearly flat except that there is usually a hump (umbo) at the center. The surface is smooth and yellow, the color being somewhat lighter when the cap is dry than when moist, and lighter also in old plants. The gills are free from the stem, rather broad, close together,, light yellow, but becoming pinkish as the spores mature. The spores are rosy pink.

The stem is 2 to 5 cm. (1 to 2 inches) long, slender, but fairly stiff, smooth, yellow, becoming hollow when old. The base of the stem is usually clothed with some of the white mycelium. There is no ring and no volva.

Although this mushroom is too small to become very popular as an edible species, yet it is good when found in sufficient numbers and is very interesting because of its beauty.

PLUTEUS ADMIRABILIS

ARMILLARIA MELLEA

THE HONEY-COLORED MUSHROOM (edible)

Armillaria mellea

Armillaria mellea is a very common and widely distributed mushroom which occurs in late summer and autumn. It grows at the bases of stumps and dead trees or from buried roots or from the living roots of trees. It is usually found in clusters, the numbers of individuals in each varying from a few to very many. It is a very variable species, so that the description of any one specimen is not likely to apply very well to the next specimen found, and a beginner is apt to collect a half-dozen specimens of this plant from different places and think he has as many species; yet the plant has an individuality which, when one is once familiar with it, is not likely to be mistaken in any of its forms.

The cap is 3 to 10 cm. (1 to 4 inches) broad, oval or convex at first and then nearly flat, but usually with a slight elevation in the center. The color varies from honey-color to nearly white, or it may be yellowish or reddish brown. Usually the central portion is adorned with erect, pointed, brown or black scales, while the margin is free from scales, but is striate, especially in old specimens. Occasionally, however, the entire cap is smooth. The flesh is white or whitish.

The gills are attached to the stem either squarely (adnate) or extending down the stem (decurrent). They are at first white, but, when older, are often stained with brown or rust-colored spots. The spores are white and very abundant.

The stem is 3 to 15 cm. (1 to 6 inches) long, and smooth or somewhat scaly. It is somewhat elastic and spongy or hollow within. The color is as variable as that of the cap, but the stem is usually somewhat darker toward the base. The ring is also variable. It may be quite thick and persistent or very thin and membranous, and sometimes it disappears entirely. There is no volva. The mycelium often forms ropelike strands which are at first white, but later become dark-colored. They can usually be found by digging carefully where the fruit-bodies are growing.

This mushroom is sometimes a serious parasite on the roots of trees. It is not ranked among the best of edible species because it is somewhat tough and not very high-flavored. The caps are meaty, however, and when chopped into small pieces they make good patties and croquettes. They are also useful for seasoning the gravies of various meats.

THE HARD PHOLIOTA (edible)

Pholiota dura

Pholiota dura occurs from May to October in pastures, lawns, parks, and other grassy places, and sometimes is quite common. The best time to look for it is during or after a few days of rainy weather.

The cap is 3 to 10 cm. (1 to 4 inches) broad. It is fleshy, but firm, at first convex, then expanded and nearly flat or sometimes with an elevation at the center. The surface is at first even and smooth, or nearly so, and often moist, but not sticky. Later the surface becomes cracked into irregular patches. The color is whitish, though not a clear white, being tinged with yellow or tan. In mature specimens the margin is often turned upward.

The gills are attached to the stem either squarely or with a short tooth extending down the stem. They are quite broad and close together, and unequal in length; that is, short ones are interspersed among the longer ones. They are at first creamy white, then rusty brown, but with the edge often remaining white. The edge of the gills is often serrate or toothed. The spores are rusty brown in mass.

The stem is 5 to 10 cm. (2 to 4 inches) broad, rather slender, usually hollow, whitish or flesh-color, and smooth or nearly so. The stem is usually nearly straight, but sometimes in very wet weather the cap becomes too heavy for the stem and bends it over. Later, as it dries out, the response to gravity causes the stem to grow in such a way as to bring the cap into a horizontal position. If this is repeated several times, because of subsequent showers, the stem may have very peculiar crooks and curves.

In young specimens the inner veil is stretched from the stem to the margin of the cap. When it breaks it either tears away from the cap and forms a very definite ring on the stem, or it tears away from the stem and remains clinging to the margin of the cap, thus forming no ring at all. There is no volva.

Pholiota præcox, in which the surface of the cap remains smooth, is very closely related to this species. Both are good to eat.

PHOLIOTA DURA

PHOLIOTA ADIPOSA

THE FATTY MUSHROOM (edible)

Pholiota adiposa

Pholiota adiposa grows sometimes singly, but more often in clusters on the trunks of living trees, fallen logs, stumps, etc. It may be looked for from June to November, but will be found most frequently after the middle of the summer.

The whole plant is yellow. The cap varies from 3 to 15 cm. (1 to 6 inches) broad. It is at first convex or hemispherical, but finally becomes nearly flat. The yellow surface is very viscid or sticky except when thoroughly dry, and it has on it numerous scales which are darker than the rest of the surface. The flesh is quite thick and firm and yellowish white in color.

The gills are attached squarely against the stem in young specimens, but as they get old they partly break away and so form a notch next to the stem. They are quite broad, but thin and rather close together. The color is yellow, but becomes more or less rusty as the spores mature. The spores themselves are rusty yellow.

The stem is 3 to 10 cm. (1 to 4 inches) long and usually curved because of the position in which the plants grow. The stem is rather stout, firm and solid. It is yellow in color and usually scaly. The ring is thin and loose in texture and usually disappears entirely before the plant is very old. There is no volva.

This plant is easily recognized because of its bright color and viscid cap and the clusters of it are often very attractive.

THE PARASTIC STROPHARIA (edible)

Stropharia epimyces

This plant is of especial interest because it is parastic on the shaggy-mane mushroom (*Coprinus comatus*). It has also been reported as occurring on the inky-cap mushroom (*Coprinus atramentarius*). The host plant is so deformed that it requires careful observation to determine to what species it belongs. It is usually irregularly top-shaped with the center deeply depressed, and the parasitic *Stropharia* grows from the bottom of this depression. It occurs either singly or in clusters, and may be looked for whenever and wherever the shaggy-mane or the inky-cap occurs.

The cap is 2 to 7 cm. (1 to 3 inches) broad, at first rounded, then convex, and finally expanded, fleshy, thin at the margin, but quite thick toward the center. The color is dirty white, sometimes becoming darker with age, and the surface is covered with numerous downy scales. Fragments of the inner veil are often found hanging to the margin of the cap.

The gills are attached to the stem, but have a tendency to break away from it at maturity. They are at first gray, then dark brown. The spores are blackish with a purplish tinge.

The stem is 3 to 8 cm. (1 to 3 inches) long, fleshy, soft, and colored like the cap. The ring is near the base of the stem and is very delicate, sometimes scarcely noticeable. There is no volva.

This is an excellent edible species. The taste is exactly like that of the mushroom on which it grows. For this reason, any one who is fond of the flavor of the shaggy-mane and yet prefers his mushrooms plain-fried, may consider himself very fortunate if he finds the parasitic *Stropharia*, since the *Coprini* are not firm enough to fry nicely, while *Stropharia epimyces* is.

STROPHARIA EPIMYCES

STROPHARIA SEMIGLOBATA

THE SEMIGLOBOSE STROPHARIA (edible)

Stropharia semiglobata

This is a common and widely distributed mushroom. It grows on dung, and on the ground on rich lawns, pastures, and other grassy places which have been recently manured, and may be looked for during wet weather from April to November. The plants are usually scattered, but sometimes grow in clusters, and occasionally two or three may be found joined together at the base.

The cap is 1 to 7 cm. (0.5 to 3 inches) broad. In the smaller specimens the cap is almost perfectly hemispherical; in larger specimens it is more nearly flat. It is smooth, but sticky when moist. It is rather thin at the margin, but thicker and fleshy at the center, and the color is usually light yellow, though occasionally it is nearly white or quite dark.

The gills are very broad, and are attached squarely against the stem. They become nearly black, but are sometimes more or less mottled with lighter and darker spots. The spores are blackish purple.

The stem is 3 to 12 cm. (1 to 5 inches) long, slender and hollow, but firm, cylindrical, straight, sometimes slightly bulbous at the base, smooth, but sometimes sticky. The color is usually yellowish but like that of the cap it varies from whitish to quite dark, and is often powdered with the dark spores. The ring is somewhat above the middle of the stem, and when moist it is sticky or gummy. There is no volva.

The variation in size of this plant is quite remarkable. If one who does not know the plant were to find only the largest and the smallest specimens shown in the photograph, he would scarcely think them belonging to the same species, but with the whole series before us it is easy to see that they are really all the same.

Although this mushroom has never become very popular for table use, the caps, when cooked, are really very good.

THE WHITE TRICHOLOMA (edible)

Tricholoma album

This mushroom grows on the ground in woods, either singly or in clusters, from August to October, and is quite common.

The cap is 5 to 10 cm. (2 to 4 inches) broad, quite thick and fleshy, but a little tough, and usually entirely white, though sometimes tinged with yellow toward the center. It is at first convex, but becomes flat, and finally depressed at the center. The surface is smooth and dry. The margin in young specimens is turned inward, but in older specimens it is straight. The flesh is white, without any decided odor, but with a slightly bitter taste.

The gills are attached to the stem, and either have a distinct notch or are merely rounded at the stem end. They are somewhat crowded, quite broad, and white in color. The spores are white.

The stem is 5 to 10 cm. (2 to 4 inches) long, solid, firm, smooth, and white in color. There is no annulus and no volva.

The genus *Tricholoma* does not give us any very excellent edible species. *T. album* is perhaps as good as any of them. The bitter, unpleasant taste of the raw flesh is entirely overcome in cooking, and the plant is very good for soups or for patties.

Another species of *Tricholoma* that is likely to be found, is *T. personatum*, which is easily recognized by the lilac or violet-tinged color of the cap and stem and the violet color of the gills. It is considered better than *T. album* by some people.

TRICHOLOMA ALBUM

ENTOLOMA GRAYANUM

THE GRAY ENTOLOMA (not edible)

Entoloma grayanum

The *Entolomas*, as well as the *Hebolomas* and *Inocybes*, are rather uninteresting, usually dull-colored plants, and none of them are edible. *Entoloma grayanum* grows on the ground in woods from August to October.

The cap is 4 to 12 cm. (1.5 to 5 inches) broad, whitish or light gray in color, and smooth or sometimes slightly wrinkled toward the center. The flesh is thin, whitish, and of rather loose — that is, not compact — texture. The gills are attached to the stem by the upper angle (adnexed). They are broad, rather close together, and white at first, but become pink as the spores mature. The spores are pink.

The stem is 5 to 12 cm. (2 to 5 inches) long, rather stout, smooth, often silky-shining, and watery-white. There is no ring and no volva.

Amateur collectors are sometimes heard to say that all pink-gilled mushrooms are edible, having been led to this conclusion by the fact that the species of *Agaricus* which are edible have pink gills, but it must be pointed out that species of *Entoloma* whose gills become pink with age are dangerous. The 'pink-gill rule,' therefore, like all other rules concerning edible and poisonous mushrooms, is dangerous to follow unless one knows the plants by their botanical characters.

THE WEEPING HYPHOLOMA (edible)

Hypholoma velutinum

Hypholoma velutinum may be looked for in suitable weather from July to October. It grows in wet places along ditches, under bridges, in borders of woods, and in open grassy places. The plants are sometimes scattered, but more often they grow in dense clusters of a few to many individuals. It also occurs sometimes on decayed wood.

The cap is 2 to 8 cm. (1 to 3 inches) broad. It is at first convex, then expanded, often with a broad elevation of the central portion, and usually with irregular, radiating wrinkles. The surface is covered with silky threads or scales, which, however, are sometimes washed off by rains. The color is light or dark yellowish, darker at the center and becoming darker with age. Old specimens are often stained black when spores have fallen upon them or have been washed upon them by rains. The flesh is soft and brittle and whitish, but sometimes tinged with yellow or brown.

The gills are attached squarely against the stem, and are usually notched (sinuate). They are at first whitish or light yellowish, but soon become darker and spotted with black or brown as the spores mature. The edge, however, remains whitish. In the morning or in wet weather minute drops of moisture are formed on the edges of the gills, which accounts for the common name — 'The Weeping *Hypholoma*.' The spores are brownish purple.

The stem is 3 to 8 cm. (1 to 3 inches) long, straight or curved, colored like the cap, somewhat scaly as far as the attachment of the veil, and smooth above. The inner veil is hairy and rather delicate. It remains clinging to the margin of the cap, for the most part, and disappears with age.

Since this mushroom grows in dense clusters, the caps are often made irregular from mutual pressure. I have eaten freely of this species, and, while I do not consider it one of the best of mushrooms, it is perfectly safe and compares very well with other species of *Hypholoma*.

HYPHOLOMA VELUTINUM

HYPHOLOMA LACRYMABUNDUM

THE SCALY HYPHOLOMA (edible)

Hypholoma lacrymabundum

This handsome and conspicuous mushroom occurs in small or large clusters on the trunks of trees, stumps, etc., or on the ground where there are buried roots or other decaying wood. It is often quite common and may be looked for from July to December, though it is usually not abundant until after the middle of August. It is easily identified and can often be seen from a considerable distance, especially in the latter part of the season after the leaves have fallen.

The cap is 3 to 12 cm. (1 to 5 inches) broad, fleshy, convex to bell-shaped and then flattened, or sometimes with the margin upturned, and usually with a prominent elevation at the center. The surface is dry, and the ground-color is yellowish or rusty, but covered by numerous persistent dark-brown scales. The flesh is rather thin, quite compact, and pale yellow or white in color.

The gills are rather narrow, close together, attached squarely to the stem, but later breaking away from it. They are at first yellowish or olive and later become purple-brown. The spores are purple-brown.

The stem is 7 to 20 cm. (3 to 8 inches) long, nearly cylindrical, but often tapering to a rather small base. The color is the same as that of the cap and the stem is clothed with scales except near the top. There is no ring and no volva.

The odor of this plant is sometimes rather disagreeable, but in some specimens it is scarcely noticeable. The taste of the young caps is sweet and mealy. As they become more mature, they are less palatable, and should be used, therefore, when young. The young caps when cooked are of excellent flavor.

There has been some confusion about the name of this plant. It is the plant which Hard calls *Pholiota squarrosa*, but it answers to Kauffman's description of *Hypholoma lacrymabundum*. The labels on Kauffman's photographs of *Hypholoma lacrymabundum* and *Hypholoma velutinum* are apparently interchanged.

THE APPENDICULATE HYPHOLOMA (edible)

Hypholoma appendiculatum

Hypholoma appendiculatum occurs from May to October in lawns, gardens, pastures, etc., and also in the woods. It is usually found in the immediate vicinity of trees or bushes, though not always. The plants grow either scattered or clustered, and sometimes are very abundant.

The cap is 3 to 8 cm. (1 to 3 inches) broad. It is thin and fragile, at first convex, then expanded, and often with radiating wrinkles on the surface. The color is whitish, often yellowish toward the center, and the thin margin is sometimes tinged with purple. The margin is sometimes wavy and is often adorned with fragments of the white, woolly veil. When dry the cap is opaque, and when moist it is nearly transparent. In dry weather it often splits radially.

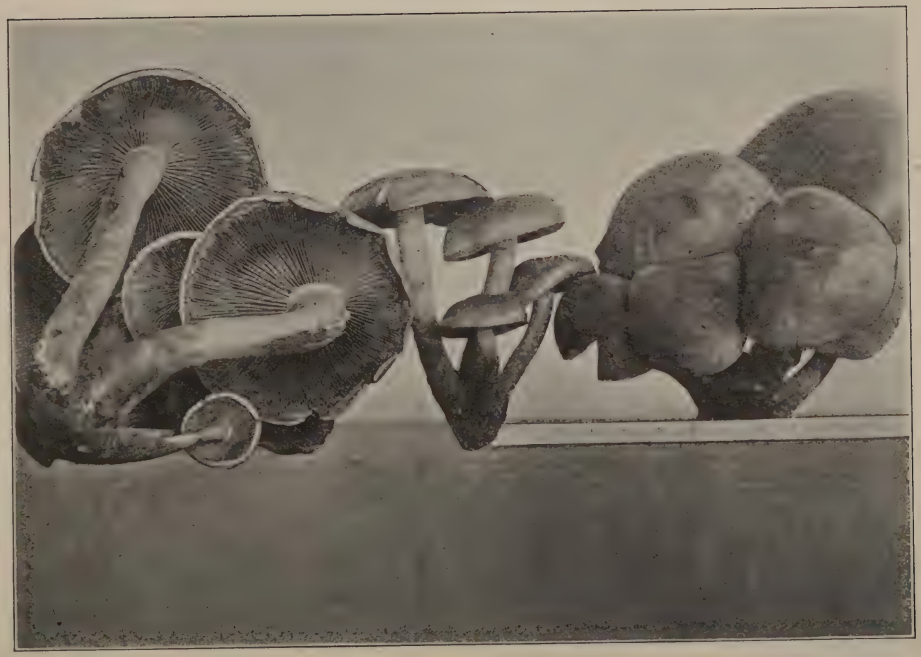
The gills are thin, narrow, close together, and attached to the stem. They are at first whitish, but become purplish brown as the spores mature. The edges are often uneven. The spores are purple-brown.

The stem is 3 to 10 cm. (1 to 4 inches) long, cylindrical, usually straight, slender, hollow, easily splitting, white, and smooth or slightly scurfy toward the top. There is no ring normally, and no volva. Sometimes, however, the veil remains partly or entirely on the stem forming a more or less definite ring.

The plant is small, but its abundance often makes up for its small size. The caps are very tender and good.

Hypholoma candolleanum and *Hypholoma incertum* are both closely related to *H. appendiculatum* if not identical with it. It is, at least, not a serious thing to mistake one for another of these three species when collecting for the table, since all are equally good.

HYPHOLOMA APPENDICULATUM



HYPHOLOMA SUBLATERITIUM

THE BRICK-RED HYPHOLOMA (edible)

Hypholoma sublateritium

Hypholoma sublateritium is a very common species in autumn. It grows in clusters of five or six to twenty or more on stumps, or sometimes on buried roots in which case they appear to be growing on the ground. The plant is easily recognized by its dark brick-red color, and it may be looked for from August until its growth is stopped by cold weather in November or December.

The cap is from 3 to 8 cm. (1 to 3 inches) broad. It is at first somewhat convex, but later nearly flat, and entirely without scales. The color is dark brick-red at the center and becomes paler toward the edge. The flesh is thick and firm and whitish in color or sometimes yellowish in old plants.

The gills are narrow, close together, and attached squarely against the stem. They are at first whitish, but become dark as the spores mature. The spores are purple-brown.

The stem is 5 to 12 cm. (2 to 5 inches) long, rather stout, and often tapering downward. It is whitish at the upper end shading to rusty color below. It is smooth and usually curved because of the crowded growth. There is no ring and no volva.

Sometimes this plant is found to be slightly bitter, but usually it has a mild and agreeable flavor.

THE COMMON PANÆOLUS (edible)

Panæolus retirugis

This is a very common mushroom which occurs everywhere on manure or richly manured soil on lawns, in fields, along roadsides, and in woods. It is found throughout the season from May to November.

The cap is 1 to 3 cm. (0.4 to 1.2 inches) broad, oval to hemispherical, but never flat, rather firm, without scales or hairs, and varying from dark smoky color to creamy white. The flesh is thin. The gills are attached squarely against the stem, but have a tendency to break away in old plants (a condition spoken of as adnate-seceding). They are broad, close together, and at first white, but soon become spotted with light and dark spots. This is due to the fact that the spores which are black when mature do not all ripen at the same time.

The stem is 5 to 15 cm. (2 to 6 inches) long, slender, cylindrical in shape, and whitish or darker in color. There is no ring and no volva.

This is the only species of *Panæolus* that is very common. Although it is edible, it is not very good, and most people do not care for it.

PANÆOLUS RETIRUGIS

CANTHARELLUS CIBARIUS

THE EDIBLE CHANTERELLE (edible)

Cantharellus cibarius

Cantharellus cibarius grows on the ground in woods from June to September. It is widely distributed and often very abundant in midsummer of a rainy year.

The cap is 5 to 10 cm. (2 to 4 inches) broad, fleshy, rather thick, at first convex and with the margin incurved, then flat, and finally somewhat funnel-shaped. It is firm, with a smooth surface, but often quite irregular, with its margin wavy, and sometimes more or less one-sided; that is, with one side developed more than the other. The color is rich egg-yellow. The flesh is white, peppery to the taste when raw, and usually with a faint odor of apricots.

The gills are thick, but so narrow that they appear like swollen veins. They are quite far apart, usually crooked, and fork or run into each other irregularly and extend down the stem somewhat (decurrent). They are colored like the cap. The spores are white or faintly yellowish.

The stem is short, firm and solid, smooth, often tapering downward, sometimes curved, and colored like the cap, but usually a shade lighter. There is no ring and no volva.

This plant is highly prized everywhere as an edible species. The peppery taste of the fresh plants entirely disappears on cooking.

Sometimes, as in the specimen at the right in the photograph, the lower surface of the cap is smooth; that is, there are no gills at all. This form has been thought by some authors to be a different plant and has been described under the name *Craterellus cantherellus*.

THE FALSE CHANTERELLE (slightly poisonous)

Cantharellus aurantiacus

The false chanterelle is a common and widely distributed species which grows in the woods on the ground, or on rotten wood, from July to October. It is easily recognized by its orange-colored cap, and by the yellow gills — which are very regularly forked.

The cap is 2 to 7 cm. (1 to 3 inches) broad, fleshy, and soft, convex, then expanded and plane, and finally funnel-shaped. The margin is plane and even, or wavy and incurved — strongly so in young plants. The color varies from yellow to orange or even brownish, especially toward the center. The surface is smooth or slightly hairy, the hairs short and silky, especially toward the center. The flesh is slightly yellowish.

The gills are thin, blunt on the edge, close together, straight and regularly forked several times, and decurrent on the stem. The color varies from yellow to orange. The spores are white.

The stem is 3 to 6 cm. (1 to 2 inches) long, stout, and somewhat lighter colored than the cap. It is at first solid, then spongy and stuffed with a cottony substance, or sometimes hollow, usually tapering slightly upward, smooth, and often curved. There is no ring and no volva.

Although *Cantharellus aurantiacus* has been eaten by a number of people in this country with no evil results, yet it has generally been considered poisonous, especially in Europe, and, therefore, for the present at least, it had better be left alone.

Another species of *Cantharellus* that is apt to be found, is *C. cinnabarinus*. This is a small plant and very pretty, the whole plant being deep cinnabar-red. The gills are narrow, blunt on the edge, far apart, and branched. This species is edible.

CANTHARELLUS AURANTIACUS

CLITOCYBE ODORA

THE SWEET-SMELLING CLITOCYBE (edible)

Clitocybe odora

Clitocybe odora is very easy to identify because of the olive-green color and the pleasant spicy odor. It grows in grassy places in the woods or on dead leaves or twigs from August to October. The plants are either scattered or clustered.

The cap is 2 to 7 cm. (1 to 3 inches) broad, fleshy, but tough, at first convex, but soon becoming plane or nearly so. The flesh is quite thick and whitish, while the surface is olive-green, the color fading more or less with age. The surface is smooth and even, though the margin is often slightly downy. The cap is usually quite regular, though the margin is sometimes wavy.

The gills are broad, rather close together, and attached to the stem, either adnate or slightly decurrent. The color is white or greenish. The spores are white.

The stem is 2 to 5 cm. (1 to 2 inches) long, cylindrical or somewhat thickened at the base, solid, stuffed, or hollow. It is at first somewhat downy, but soon becomes smooth, though the base is usually covered with white filaments. The color of the stem varies from white to green. There is no ring and no volva.

The anise-like odor of this mushroom is very persistent, and the taste is very spicy. While the flavor is pleasant, it is rather strong, but if a few specimens are cooked along with other plants that are not so strong in flavor, they are excellent.

When the plants are dried, the green color fades, but the odor sometimes persists for several years.

THE MANY-CAP CLITOCYBE (edible)

Clitocybe multiceps

Clitocybe multiceps is common and sometimes very abundant. It grows on the ground, usually in grassy places, in clusters of from ten to as many as one hundred individuals. It may be looked for from May to October, though it is not likely to be found during midsummer.

The cap is 3 to 7 cm. (1 to 3 inches) broad. It is fleshy, although the flesh is not very thick except at the center, and very firm. It is convex, or sometimes nearly flat, and often irregular from mutual pressure. The color varies from whitish to yellowish gray or brown. The surface is smooth or sometimes slightly silky toward the center, and is moist in wet weather. The flesh is white, and when uncooked it has an oily taste which is somewhat disagreeable.

The gills are whitish, close together, narrow at each end, and attached to the stem either adnate or slightly decurrent. The spores are white.

The stem is 5 to 10 cm. (2 to 4 inches) long, cylindrical, or somewhat thickened at the base, firm, but more or less elastic, smooth on the outside, but sometimes covered with a powdered substance toward the top, and hollow or stuffed with a cottony substance within. There is no ring and no volva.

The spring clusters of this mushroom are often more tender and of better flavor than those appearing in autumn. Some people are very fond of the many-cap *Clitocybe,* while others do not like it.

CLITOCYBE MULTICEPS

CLITOCYBE ILLUDENS

THE DECEIVING CLITOCYBE (not edible)

Clitocybe illudens

This very beautiful mushroom grows about the bases of stumps and dead trees, or from underground roots, from July to October. It usually grows in clusters of from ten to fifty individuals and sometimes is very abundant. The deep, bright yellow color of the entire plant makes the clusters conspicuous from a considerable distance.

The cap is 7 to 20 cm. (3 to 8 inches) broad, convex or nearly plane, or sometimes somewhat funnel-shaped, but usually with a small elevation at the center. It is smooth and often quite irregular in shape. The color is bright yellow or orange-yellow. In old plants the color is sometimes brownish. The flesh is thick at the center, but thin toward the margin. It is whitish or yellow and has a strong odor and a disagreeable taste.

The gills are yellow, not crowded, narrowed toward each end, and unequally decurrent; that is, some of them extend down the stem for a considerable distance and others not so far. Some of them are branched. The spores are white.

The stem is 7 to 20 cm. (3 to 8 inches) long, and tapers toward the base. It is firm, solid, smooth, and colored like the cap, or sometimes brownish toward the base. There is no ring and no volva.

It is too bad that this attractive plant is not edible, since it is often so abundant that one could easily collect several bushels. While it is not deadly poisonous, most people are made ill by eating it, and it should, therefore, be avoided.

An interesting thing about this mushroom is that it is phosphorescent; that is, when fresh specimens are placed in a dark room they emit a glowing light. For this reason the plant is sometimes called 'Jack-o'-lantern.'

THE PURPLE CLITOCYBE (edible)

Clitocybe ochropurpurea

The purple *Clitocybe* occurs from July to September in open grassy or bushy places and in woods. It grows either solitary or in groups and clusters, and is quite common and sometimes abundant.

The cap is 5 to 10 cm. (2 to 4 inches) broad, fleshy, but firm and tough, at first nearly hemispherical or convex and with the margin curved in toward the stem, later becoming nearly plane or slightly depressed at the center. It is often very irregular. When the cap is moist the color is purplish brown, but when dry it is much lighter and gray or pale yellowish.

The gills are broad, thick, rather far apart, and attached to the stem, either adnate or decurrent. They are purplish in color. The spores are white, sometimes with a slight tinge of lilac or yellow when viewed in mass.

The stem is 3 to 10 cm. (1 to 4 inches) long. It is very variable, being nearly cylindrical, or thicker in the middle or at each end. It is fibrous and solid, and colored like the cap, but usually paler. There is no ring and no volva.

This mushroom is very variable in size and shape. Although it is a tough plant, it cooks tender and can be used to good advantage in patties or croquettes. It is a good keeper, and is not so readily attacked by insects as many other mushrooms.

There seems to be little doubt that *Clitocybe ochropurpurea* forms mycorrhizas with the roots of the white oak and perhaps also with the American elm.

CLITOCYBE OCHROPURPUREA

COLLYBIA RADICATA

THE ROOTING COLLYBIA (edible)

Collybia radicata

Collybia radicata is a very common and widely distributed mushroom, and one that is easily recognized. It grows on the ground in woods or groves or sometimes on lawns and other grassy places. It is often found near stumps and sometimes grows upon rotten stumps or logs. It grows singly, but usually when a specimen is found a number of others will be found within a short distance. This mushroom may be found in suitable weather from May to October.

The cap is 3 to 10 cm. (1 to 4 inches) broad, fleshy, but rather thin, at first convex, then flat or with the margin upturned in old plants, and sometimes with an elevation (umbo) at the center. The surface is smooth, but often wrinkled, especially toward the center, and when moist it is sticky (viscid). The color varies from nearly white in some of the smaller specimens to gray or brown in larger ones. The flesh is pure white, rather thin, and tough-elastic.

The gills are snow-white, broad, unequal in length, rather far apart, and attached to the stem at the upper angle. The spores are pure white and very abundant. A very perfect spore-print can often be made from this mushroom in a few minutes.

The stem is 10 to 20 cm. (4 to 8 inches) long, colored like the cap, or sometimes paler, and usually white at the upper end. It tapers gradually upward, and at the lower end it is somewhat enlarged and then tapers off into a long, slender, rootlike structure in the ground. It is this character that gives the plant its specific name. The stem is firm, often twisted, and smooth, but often striate or grooved.

This is a very attractive and clean-looking species. The caps, when fried, are sweet and pleasing to the taste.

THE BROAD-GILLED COLLYBIA (edible)

Collybia platyphylla

Collybia platyphylla is a large stout mushroom which grows from June to October on rotten logs or on the ground near rotten logs or stumps. It is found mostly in the woods, but occasionally also in open pastures, especially in recently cleared fields.

The cap is 7 to 15 cm. (3 to 6 inches) broad, at first convex, but soon expanded and nearly flat or with the margin upturned, fleshy, thin and fragile. The surface appears watery when moist, and usually is streaked with fine dark hairs, but the ground-color is brown or gray or sometimes nearly white. The flesh is white. The cap is sometimes quite irregular, and the stem is not always exactly in the center. The thin margin is often split in various places.

The gills are very broad, as much as a half-inch or more sometimes. They are soft and white, not very close together, and are attached to the stem by the upper angle. In old plants the gills are usually broken or cracked more or less. The spores are white.

The stem is 7 to 12 cm. (3 to 5 inches) long, rather soft, stuffed with a cottony substance, nearly cylindrical, more or less streaked with fibers, but otherwise smooth, whitish, and sometimes slightly powdered at the upper end. There is no ring and no volva. The mycelium is very abundant and extends from the base of the stem in rootlike or cordlike strands, though not at all like the root of *Collybia radicata*.

When fresh and in good condition the caps taste well, though they are not so pleasant-flavored as some other species of *Collybia*. They must be well cooked or the taste will be slightly bitter.

COLLYBIA PLATYPHYLLA

COLLYBIA VELUTIPES

THE VELVET-STEMMED COLLYBIA (edible)

Collybia velutipes

Collybia velutipes is particularly interesting because it grows nearly the whole year round. It has been found in good condition in every month of the year. It grows on stumps, logs, roots in the ground, earth that has a good deal of wood material in it, and also on the trunks of living trees. It is common and plentiful, and, while the heavier crop usually appears from September to November, it is often abundant in the spring, and likely to be found at any time.

The cap is 3 to 8 cm. (1 to 3 inches) broad, at first convex, but soon becoming plane, fleshy and moderately thick at the center, but thin toward the margin, often irregular and sometimes eccentric; that is, with the stem not exactly at the center. The surface is smooth, quite sticky or viscid when moist, and somewhat striate at the margin. The color is yellow or brownish yellow, sometimes paler toward the margin. The flesh is soft and watery and slightly yellowish in color.

The gills are quite broad, and rounded at the end next to the stem. They are very nearly free from the stem, but are slightly attached by the upper angle. They are not close together and are very unequal in length. The color of the gills is pale yellow or tan. The spores are white.

The stem is 3 to 8 cm. (1 to 3 inches) long, tough, often twisted, sometimes curved, hollow, or stuffed with fibers. The surface of the stem is whitish when young, but soon becomes dark brown or black and densely velvety with fine black threads. This velvety covering of the stem makes the plant easy to identify. There is no ring and no volva.

Collybia velutipes sometimes grows singly or scattered and sometimes in clusters, often very dense clusters of from three or four to twenty or more individuals.

Although this mushroom is not a true parasite on living trees, it is said to do considerable damage sometimes. The mycelium grows mostly just beneath the bark, and by its continual growth it gradually pries the bark away from the wood, and may even cause the bark to fall away, leaving the trunk bare.

Although this is not one of the best mushrooms for the table, it is considered excellent by some, and, because of its plentifulness, it is a valuable one to know.

THE OAK-LOVING COLLYBIA (edible)

Collybia dryophila

Although *Collybia dryophila* is called the oak-loving *Collybia*, it grows not only under oak trees, but under most any kind of trees in the woods as well as in open places. It is a very common plant and so variable that it is very difficult to describe it in such a way as to include all its forms. It is found in suitable weather from May to October, and grows either singly or in clusters.

The cap is 3 to 5 cm. (1 to 2 inches) broad, convex or plane, or sometimes depressed in the center and with the margin upturned. The color varies from brown to bay-red or tan and usually becomes paler with age. The cap is tough, slightly fleshy, but thin, and sometimes irregular in shape. The surface is normally smooth, but sometimes there are abnormal outgrowths of tissue upon it. The flesh is thin and white.

The gills are very narrow, crowded close together, and very nearly free from the stem, but slightly attached by the upper angle (adnexed). They are white or whitish or sometimes yellowish.

The stem is 3 to 8 cm. (1 to 3 inches) long, cylindrical or somewhat thickened at the base, firm and tough, smooth, hollow, usually colored like the cap, but sometimes inclining more to reddish. There is no ring and no volva.

This is considered an excellent mushroom by some, but perhaps the greatest thing in its favor is its plentifulness. One foreign author, years ago, reported a case in which illness was caused by eating *Collybia dryophila*, but it has been eaten for years in this country and has not been known to make any one ill. It may therefore be considered perfectly safe provided it is fresh and in good condition.

COLLYBIA DRYOPHILA

NAUCORIA SEMIORBICULARIS

THE HEMISPHERICAL NAUCORIA (edible)

Naucoria semiorbicularis

This is the commonest species of *Naucoria* and occurs on lawns and other grassy places from May to September.

The cap is 1 to 4 cm. (0.4 to 1.6 inches) broad, hemispherical, but sometimes becoming nearly flat in old plants. It is somewhat sticky when moist, smooth, and yellowish or yellowish brown in color. The flesh is thin except at the center. The gills are attached squarely to the stem. They are broad, close together, light-colored at first, but becoming darker as the spores mature. The spores are rusty brown.

The stem is 2 to 5 cm. (0.8 to 2 inches) long, whitish, with a tough rind and a pithy interior. There is no ring and no volva.

The caps have a somewhat oily taste which some people do not like. It is therefore not considered among the best edible species.

THE PEAKED-CAP MYCENA (edible)

Mycena galericulata

This pretty little mushroom grows from late spring until frost on dead logs, stumps, sticks, etc., in the woods. It is common and sometimes very abundant. It usually grows in dense clusters of many individuals with the hairy bases of the stems glued together, though sometimes larger specimens are found growing singly. The plant is somewhat variable, and therefore not so easily identified as some other mushrooms. The accompanying photograph is very characteristic, however, and with its aid recognition of the plant should not be difficult.

The cap is 1 to 4 cm. (0.5 to 1.5 inches) broad, at first conical or bell-shaped, then expanded and often with a prominent elevation (umbo) at the center. The surface is dry and smooth, but striate (streaked with lines) from the margin to the umbo. The color is variable, but is usually some shade of brown, though occasionally it is gray or whitish.

The gills are attached to the stem squarely, but with a decurrent tooth, and are connected with each other by veins. They are not close together, and the edges are either entire or toothed. The color is white or gray or flesh-colored. The spores are white.

The stem is 5 to 12 cm. (2 to 5 inches) long, rigid, hollow, tough, straight or curved, slender, and with a smooth polished surface except at the base, where it is covered thickly with short white hairs.

This mushroom is especially rich in protein. When young the caps and stems may be cooked together, and will be found to have a pleasing and delicate flavor. If, after washing, they are allowed to stew slowly in their own fluids for about ten minutes, and are then seasoned with pepper, salt, and butter, they are excellent.

Mycena hæmatopa, the blood-foot mushroom, is a common plant which has very much the same appearance and habits as *M. galericulata*, but is distinguished by its blood-red juice. The edible qualities of the two species are the same.

MYCENA GALERICULATA

GALERA TENERA

THE SLENDER GALERA (edible)

Galera tenera

This little plant is common on lawns and pastures during wet weather from May to November. It usually grows scattered rather than clustered, and springs up quickly, so that one sometimes goes out in the morning and finds the lawn speckled with the delicate little plants.

The cap is bell-shaped and 1 to 2.5 cm. (0.5 to 1 inch) high. When moist the cap is pale rust-colored or brown, but as it dries off in the sun it becomes lighter-colored. It is commonly smooth, but occasionally one finds specimens that are covered with very fine, short, silky hairs. When the cap is damp, it is usually slightly striate, the striation lines disappearing as the cap dries.

The gills are attached squarely against the stem in the top of the bell-shaped cap. They are close together, rather broad, and cinnamon-brown in color, but with the edges usually whitish. The edges of the gills are sometimes more or less toothed or notched. The spores are dark rust-color.

The stem is usually 7 to 10 cm. (3 to 4 inches) long, straight, slender and fragile, hollow, and nearly the same color as the cap. It is usually somewhat shining and more or less striate toward the top. There is no ring and no volva.

This is rather a small plant to collect for the table, but sometimes its abundance makes up for its small size. The caps are tender and of good flavor. Cooked along with other mushrooms, it is a pleasing addition.

THE MOSS OMPHALIA (not edible)

Omphalia fibula

Very small plants with central stem and distinctly decurrent gills are pretty likely to belong to the genus *Omphalia*, while large plants with white spores and decurrent gills which are not forked would belong to the genus *Clitocybe*. Of course the genus *Omphalia* differs from *Clitocybe* by having cartilaginous stems, but most of the *Omphalias* are small, while the *Clitocybes* are usually larger.

The moss *Omphalia* is so called because it grows on or among mosses in moist places in woods. It is found throughout the season from May to October and is not uncommon.

The cap is 0.3 to 0.8 cm. (one-eighth to one-third inch) broad, at first cylindrical to hemispherical in shape, and finally expanded and depressed in the middle. It is smooth or nearly so, and pale rusty orange in color, the color fading in old plants. The flesh is very thin. The gills are decurrent, narrow, close together in young plants, but becoming farther apart as the cap expands. The spores are white.

The stem is 2 to 5 cm. (0.8 to 2 inches) long, slender, tough-cartilaginous, whitish or tinged yellow or straw color. There is no ring and no volva.

Although this plant probably is not poisonous, it is too small to be classed as edible.

OMPHALIA FIBULA

MARASMIUS OREADES

THE FAIRY RING MUSHROOM (edible)

Marasmius oreades

This is called the fairy ring mushroom because it is usually found growing in circles or in arcs of circles, though sometimes the individuals are scattered. It grows on lawns, in pastures, along roadsides, and in other grassy places, and may be looked for during wet weather from July to November. Often the fairy ring mushroom is found at the same time and in the same pasture as the meadow mushroom, *Agaricus campestris*.

The cap is 2 to 5 cm. (1 to 2 inches) broad, either convex or nearly flat, and often with an elevation at the center. The color is reddish tan, cream, or nearly white. The surface is smooth, but often striate along the margin. The flesh is rather thin, white, and tough when raw.

The gills are white, broad, and rather far apart. They are almost free from the stem, but are usually attached by the upper angle. The spores are white.

The stem is 5 to 10 cm. (2 to 4 inches) long and rather slender, but tough. It is white in color. There is no ring and no volva.

This mushroom is highly prized by many who know it. It is one of the best to dry and keep for winter use.

THE OYSTER MUSHROOM (edible)

Pleurotus ostreatus

This plant is called the oyster mushroom because the shape of the plant sometimes resembles the outline of an oyster-shell. It grows from May to December on dead trunks and branches of trees, or sometimes from wounds of living trees, usually in crowded clusters of several individuals with the caps overlapping each other. It is sometimes practically stemless, but other specimens may have a very definite stem, which, however, is always lateral; that is, at one side of the cap rather than at the center. The shape of the plant depends largely on its position. Plants growing from the upper side of a fallen log are quite different in shape from those growing from the side of the trunk or stump, since, wherever they grow, they must bring the gills into a horizontal or nearly horizontal position in order that the spores may be liberated. *Pleurotus ostreatus* is a very common and often abundant mushroom, and one that is very easy for the beginner to identify.

The cap is 5 to 20 cm. (2 to 8 inches) broad, soft and fleshy, quite thin at the margin, but thicker toward the place of attachment. It may be attached directly to the wood at one side or it may be narrowed into a short stem, and it is broadest at the outer extremity. It is usually depressed on the upper side near the place of attachment, and the margin is often incurved. The surface is moist or dry and smooth, but sometimes more or less torn into scalelike appendages. The color varies from white to gray or brown. The flesh is white.

The gills are broad, white, not much crowded, and when a stem is present they run out on it (decurrent) and narrow out into veinlike lines which branch and connect with each other. The spores are white or pale lilac.

The stem when present is short, firm, white, usually thickened upward, and often hairy at the base. There is no ring and no volva.

This mushroom is a favorite with many mushroom-eaters, but only young plants should be used, and they must be carefully and thoroughly cooked or they will be tough. When dipped in beaten egg, then in bread crumbs, and fried in very hot fat, they are excellent.

PLEUROTUS OSTREATUS

PLEUROTUS ULMARIUS

THE ELM PLEUROTUS (edible)

Pleurotus ulmarius

The elm *Pleurotus* is so called because it is often found growing on elm trees and logs. It is not confined to elms, however, but is found on many kinds of trees. It is sometimes much more common on box-elder (ash-leaved maple) than on elm. It grows from the sides of trees, where branches have been broken off or the trees have been wounded from some other cause, from September until winter. It is more likely to be found in or near cities than in the country. This is a large plant, and is easily distinguished from the oyster mushroom by its long stem, which is usually attached near the center, and by the gills, which are rounded or notched at the end next to the stem instead of decurrent. The plants usually grow singly, but several may be found on the same tree and sometimes they are more or less clustered.

The cap is 5 to 15 cm. (2 to 6 inches) broad, fleshy, but firm and compact, at first convex and with the margin incurved, then flat or nearly so, always horizontal no matter what the position of the stem may be, smooth, but often with the surface more or less cracked, white or whitish and sometimes tinged with red, yellow, or brown, and usually becoming darker and shining when old. The flesh is thick, firm, rather tough, and pure white.

The gills are broad, but narrower at each end, notched or rounded at the inner end, attached to the stem by the upper angle (adnexed), rather close together, white or whitish. The spores are white.

The stem is 2.5 to 10 cm. (1 to 4 inches) long, stout, solid, straight or curved according to the place of growth, more or less eccentric, but often very nearly, if not quite, central, often somewhat thickened at the base, smooth, or somewhat downy with short hairs, especially at the base. The stem is white, and there is no ring and no volva.

The elm *Pleurotus* has been known as an edible mushroom for a long time and is considered excellent by many people. It does not become infested with insects nearly so quickly as the oyster mushroom, and it can easily be dried and kept for winter use. Like all tree mushrooms it should be eaten when young, since old specimens are rather tough.

Although this mushroom grows on living trees, it seems to feed only on the dead portions of the bark and wood, and its growth appears to do no harm to the tree.

THE NEST-CAP CLAUDOPUS (edible)

Claudopus nidulans

Claudopus nidulans is a very pretty plant which grows on dead branches, tree-trunks, stumps, and logs during autumn. It is widely distributed and sometimes one finds a log almost completely covered with the beautiful yellow caps. The plant is closely related to the genus *Pleurotus*, which it closely resembles, but from which it differs in the color of the spores. It is usually sessile — that is, there is no stem — and the cap is attached to the wood by one side like a shelf, though sometimes it is narrowed into a very short stem. The plants often grow very close together and so overlap one another.

The caps are 2 to 8 cm. (1 to 3 inches) broad, nearly round or somewhat kidney-shaped, and in young specimens the margin is rolled inward. The surface is quite hairy or downy, especially toward the margin, and is rich yellow in color.

The gills are broad, quite close together, and bright orange-yellow in color, so that the lower surface of a group of caps may be even more beautiful than the upper surface. The spores are pink.

The odor of this plant is rather strong and somewhat disagreeable, closely resembling the viscera of freshly killed swine. The flavor is mild and pleasant, but the flesh is generally somewhat tough so that it must be well cooked.

CLAUDOPUS NIDULANS

PANUS RUDIS

THE ROUGH PANUS (edible)

Panus rudis

This rather pretty plant is very common on stumps, logs, and dead branches throughout the season from May to December. Usually the plants are crowded into small clusters, but sometimes they occur singly.

The cap is 2 to 7 cm. (1 to 3 inches) broad, somewhat irregular, one-sided or shelving, and rather tough. The surface is covered with velvety hairs which in fresh young specimens are rich reddish brown in color, but which often fade out to yellowish or dirty white in older plants. The gills are narrow, close together, and decurrent on the stem. They are usually white, but sometimes tinged with the color of the cap. The edges of the gills are entire — that is, not toothed — a character which distinguishes the genus *Panus* from *Lentinus* which has toothed gills. The spores are white.

The stem is short, lateral, or at least eccentric, covered with velvety hairs and colored like the cap. There is no ring and no volva.

Although this plant is rather tough, it is useful for flavoring gravies and can be dried and kept for winter use.

THE CONELIKE MUSHROOM (edible)

Strobilomyces strobilaceus

The peculiar name of this plant refers to the conelike appearance of the cap, and the plant is very easily recognized by this character. This plant is a Basidiomycete; that is, it produces its spores on the ends of club-shaped basidia, just as do the gill-bearing mushrooms; but instead of having gills on the under side of the cap it has little pores or tubes, and the basidia making up the hymenium are arranged on the inner surfaces of these tubes. It grows on the ground in woods from July to September.

The cap is 5 to 10 cm. (2 to 4 inches) broad, hemispherical or nearly so, dry, and very shaggy owing to numerous thick, coarse, hairy scales, of a blackish color, which project from the surface. The flesh is very interesting. It is thick and of a whitish color, but when it is cut or wounded in any way it quickly changes to red and then to black.

The layer of tubes does not separate easily from the flesh; a character which separates this plant from the genus *Boletus*. The tube layer is attached to the stem (adnate) and is whitish, becoming brown or blackish in old plants. The mouths of the tubes are large in comparison with those of some other pore mushrooms, and angular, and when they are bruised they change color just as the flesh of the cap does. The spores are dark brown or blackish when viewed in mass.

The stem is 8 to 15 cm. (3 to 6 inches) long, nearly even or sometimes tapering slightly upward, often grooved near the top, and very shaggy, having soft scales similar to those on the cap.

Before cooking this mushroom the stem should be removed, the scales cut away from the cap, and unless the tubes are very firm and fresh they, too, should be removed. The thick flesh that remains will cook well by any method. It has a rather strong taste, but is a great favorite with some people. Usually it is not very common, but occasionally one finds a troop that will make a good meal. Its appearance is so unique and its color-changes are so interesting that it is always a pleasure to find it.

STROBILOMYCES STROBILACEUS

POLYPORUS FRONDOSUS

THE BRANCHED POLYPORUS (edible)

Polyporus frondosus

This is one of the pore fungi which is not very common, but is apt to be found in any locality, and it grows so large that a single specimen is often enough for several meals. It grows at the bases of stumps and dead trees or from their roots, and also from the roots of living trees of oak and chestnut, sometimes killing the trees which it attacks. It may be looked for from September to frost.

The whole plant is 15 to 60 cm. (6 inches to 2 feet) broad, and is very much branched, so that it appears to be made up of a large number of flattened, leaflike caps. The separate caps are 2 to 5 cm. (1 to 2 inches) broad, irregular in shape, often curved, furrowed, etc., and gray or brownish in color. The surface is slightly hairy, the hairs very short. The tubes on the under sides of the caps are whitish, and their mouths are round and regular in young plants, but become irregular in size and shape as the plant matures. The flesh is white. The stem is white and very much branched.

Young plants are tender and good when broiled or fried. Older plants must be very thoroughly cooked. It is best to stew them first and then fry or broil.

Another large *Polyporus* which is apt to be found, is *P. sulphureus*, the sulphur-colored *Polyporus*, which is more common than *P. frondosus* and is highly prized by many people. The whole plant is sulphur-yellow, though the upper surface is usually darker, and often inclines to orange-color. It grows on living or dead trees, stumps, etc., sometimes causing a serious heart-rot of living trees. It is usually composed of several shelflike or fanlike caps grown together, the whole cluster becoming a foot or more across. Fresh young plants are excellent broiled, or they may be cut into small pieces and stewed slowly and thoroughly.

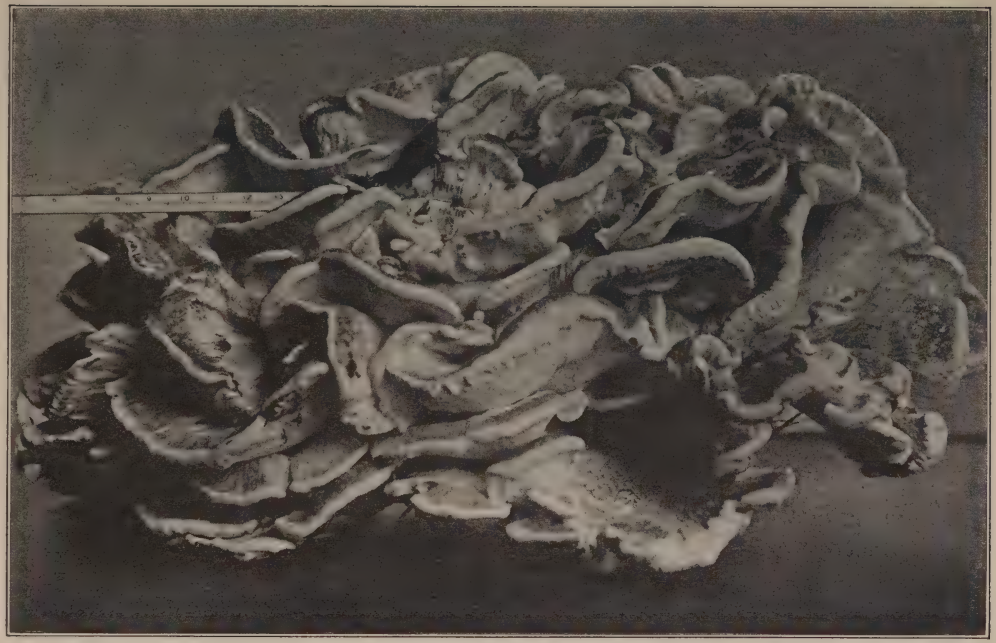
THE GIANT POLYPORUS (edible)

Polyporus giganteus

Polyporus giganteus differs from *Polyporus frondosus* in having fewer, much larger, and thicker branches. It is fleshy, but tough, and like all edible species of *Polyporus* it can be used only when young, and even then is not highly prized because it is tough and is apt to have a rather woody flavor.

The individual branches are 5 to 15 cm. (2 to 6 inches) across, somewhat velvety, gray in color, but becoming black when bruised and on drying. This blackening is even more characteristic of the pore surface. The pores are short and very small. They are at first white. The stem is short and thick. This plant is usually found growing on the ground around stumps.

Polyporus Berkeleyi resembles *P. giganteus* somewhat, but its pores are large and long. It is usually found near oak trees or stumps.



POLYPORUS GIGANTEUS

POLYPORUS ROBINIOPHILUS

THE LOCUST POLYPORUS (not edible)

Polyporus robiniophilus

This is a shelving mushroom which grows as a parasite on various kinds of trees, but especially on black locust, hackberry, and maple. The specimen shown in the photograph grew about fifteen feet above the ground from a wound in the side of a hackberry tree in Illinois. After this mushroom had been removed, several other small ones were produced the following year. Finally the tree became so weakened at this place by the growth of the mycelium in it that it was broken over during a windstorm.

The cap varies from 5 to 20 cm. (2 to 8 inches) broad, and often several are grown together as shown in the photograph. The color of the surface varies from white to ash-color or yellowish, and is smooth — that is, without hairs. The flesh is rather firm, but somewhat watery when fresh, but becomes soft and punky when dry. It is white, and when dry it often has a rather sweet odor. The pores are very small and less than one half inch long. Their mouths are white.

This mushroom is not poisonous, but it is not edible because it is too hard and tough. This is true of a large number of species of *Polyporus* which we cannot take space to describe in this book.

THE OVAL-PORED POLYPORUS (not edible)

Polyporus arcularius

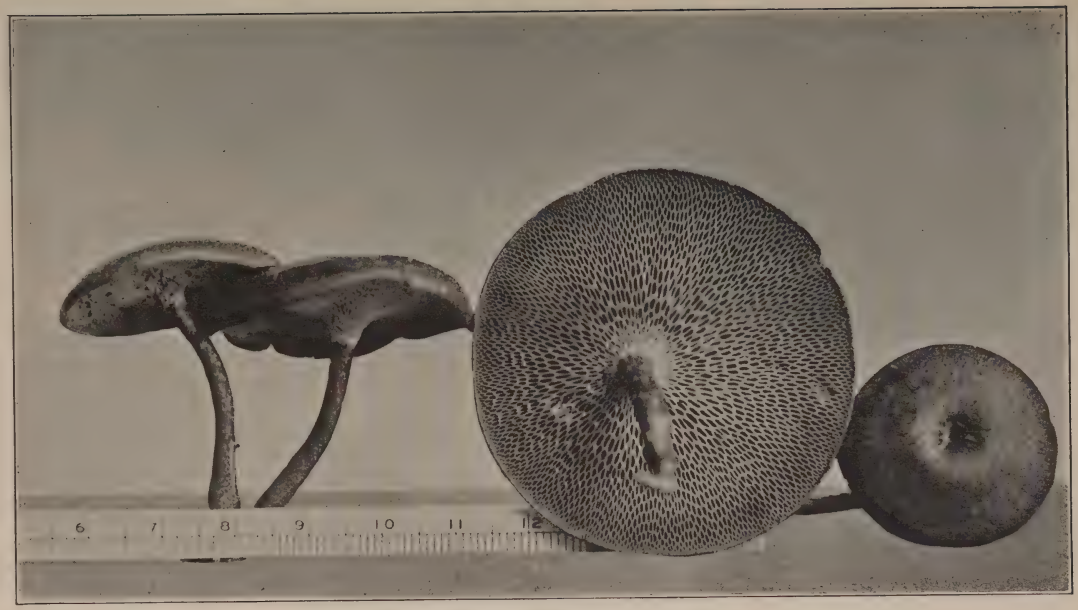
This is a *Polyporus* which is stool-shaped and grows on dead wood throughout the season. It is too tough and leathery to eat.

The cap is 1 to 8 cm. (0.5 to 3 inches) broad, nearly circular, usually with a depression in the middle, and light to dark brown in color. The pores are large, shallow, oval or angular in shape, and with whitish mouths.

The stem is 2 to 5 cm. (1 to 2 inches) long and colored like the cap.

Polyporus brumalis is closely related to *Polyporus arcularius*, but is darker-colored and has pores that are very much smaller.

Still another common stool-shaped *Polyporus* is *P. picipes*, called the black foot *Polyporus* because the lower end of the stem, which is relatively short, is black. This is a large mushroom, the cap sometimes being as much as eight inches across, and often the stem is eccentric — that is, not exactly at the center. The surface of the cap is chestnut brown or reddish brown, while the tubes, which are extremely small, are white or very light brown.



POLYPORUS ARCULARIUS

FOMES FRAXINOPHILUS

THE ASH FOMES (not edible)

Fomes fraxinophilus

The genus *Fomes* differs from *Polyporus* in that the fruit-bodies are perennial, while in *Polyporus* they are annual. In the perennial fruits of *Fomes* a new layer of tubes is added each year below the layer of the preceding year so that a section through the fruit shows several layers or strata of tubes.

Fomes fraxinophilus grows only on ash wood. It is usually found as a parasite on living ash trees, sometimes far from the ground, but it can also live as a saprophyte on dead ash wood. The photograph shows the upper surface at the left and the lower surface at the right.

The cap varies from 3 to 40 cm. (1 to 16 inches) broad. The surface is at first white, but soon becomes gray and finally black, and in old plants is often much cracked. The tubes are small and only about 2.5 mm. (0.1 inch) long, but a new layer is added each season so that the entire layer of pores may be quite thick. The separate layers are not very distinct from each other. The mouths of the tubes are white or brownish.

This whole mushroom is very woody and for that reason not edible. This is true of all species of *Fomes*, some of which are quite common. Usually the commonest one is *Fomes applanatus* which grows on dead logs and stumps. It is gray on the upper side and white on the lower side, and the lower surface is of such a texture that one can readily write on it by means of a sharpened stick or other pointed article.

THE WILLOW DÆDALEA (not edible)

Dædalea confragosa

Mushrooms belonging to the genus *Dædalea*, like those of *Polyporus*, are annual, but the pores, instead of being round, are very irregular in shape.

Many of the wood-inhabiting mushrooms are not at all particular about the kind of wood upon which they live, but others, like *Fomes fraxinophilus*, will grow on only one kind. This is true of *Dædalea confragosa*, which is very seldom found on anything except willow trees. It is often very common in autumn on living willow trees along rivers and other streams.

The mushroom is from 5 to 20 cm. (2 to 8 inches) broad, and very leathery, or when dry quite rigid. The surface is gray or brown and the interior is whitish. The tubes average about 5 mm. (0.2 inch) long, and very irregular in shape. The mouths of the tubes are whitish or flesh-colored, and become darker wherever they are bruised.

All species of *Dædalea* are too tough or woody to eat. *Dædalea quercina*, which grows on oak or chestnut, has much larger pores with much thicker partitions between them than has *Dædalea confragosa*.

DÆDALEA CONFRAGOSA

BOLETUS RETIPES

THE PRETTY-STEMMED BOLETUS (edible)

Boletus retipes

In the genus *Boletus* the whole mushrooom is soft and fleshy, and the layer of pores can easily be peeled off from the flesh of the cap. These plants become infested with larvæ rather quickly, and so decay soon after reaching maturity. They occur mostly during July, August, and September. Many of them are edible if one finds them before they have become larvæ infested. Some are non-edible because they have a bitter or disagreeable taste; and a few are slightly poisonous. Some exhibit interesting color changes when cut or bruised, and some of the bright-colored ones are very pretty.

Boletus retipes grows in the woods as do most other species of the genus. The cap is 5 to 10 cm. (2 to 4 inches) broad, smooth, and varies in color from yellowish brown to olive brown or darker. The flesh is whitish, and does not change color when bruised. The tubes are yellow. The stem also is yellow, and beautifully reticulated with a network of threads on the surface. The stem is from 5 to 10 cm. (2 to 4 inches) long.

THE POROUS BOLETINUS (edible)

Boletinus porosus

Boletinus porosus is another mushroom belonging to the pore fungi. It is seen to be separate from two closely related genera, *Boletus* and *Polyporus*, by noting the following facts: In *Boletus* the flesh is very soft and the pore layer can easily be separated from the flesh. In *Polyporus* the flesh is tough and the pore layer cannot easily be separated from the flesh. *Boletinus* resembles *Polyporus* in that the tube layer is not easily separable from the flesh, but it resembles *Boletus* in having very soft flesh.

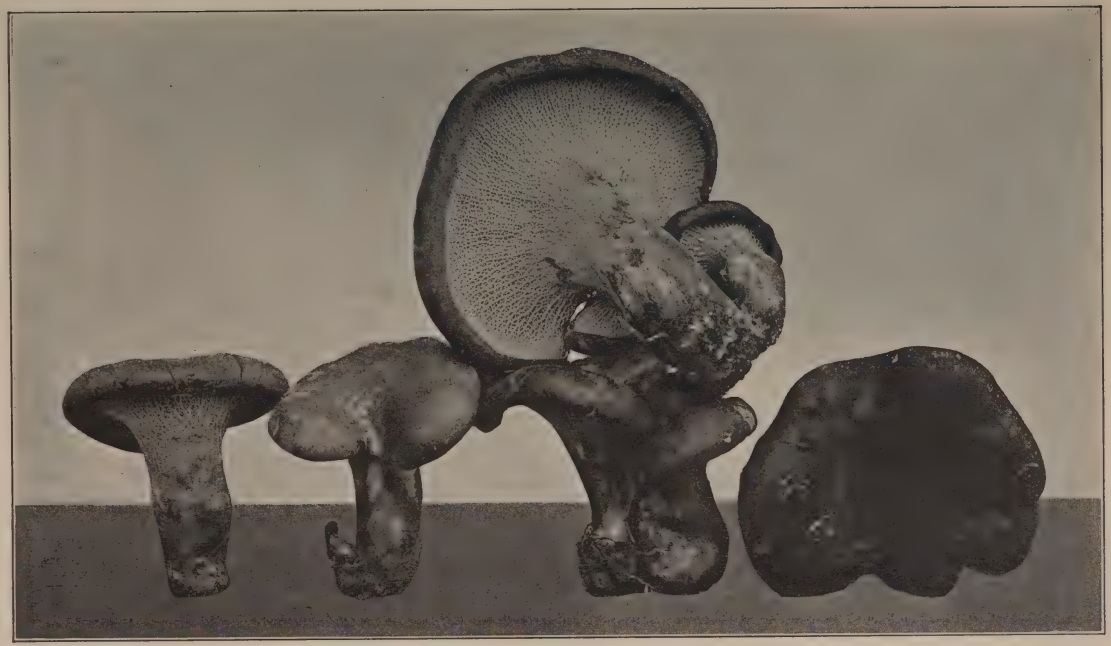
Boletinus porosus grows on damp ground, in the woods and in open places, from July to September. It is often locally quite abundant and often grows in troops, so that if one is found others are likely to be found near by.

The cap is 5 to 12 cm. (2 to 5 inches) broad, dry or moist and sticky, usually shining, smooth, and reddish brown or yellowish brown in color. The margin is thin, quite even, and usually turned inward. The shape of the cap is somewhat irregular and often is nearly kidney-shaped.

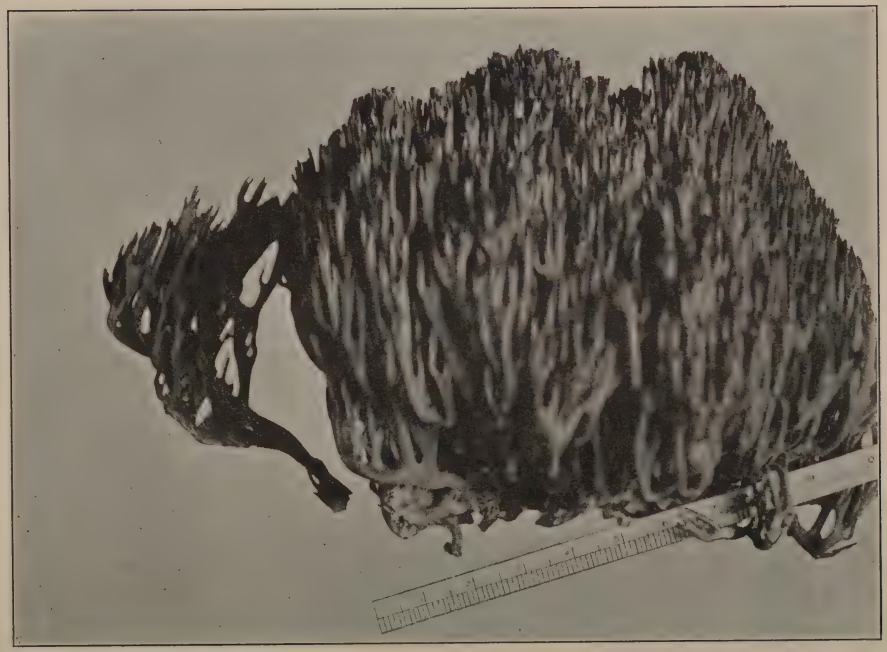
The pore surface is yellow. The pores are large and angular, but very shallow, and are arranged more or less in radiating rows. Some of the partitions are more prominent than others, appearing somewhat like gills that branch, and are connected by cross-partitions of less prominence. The spores are brownish yellow.

The stem is 2 to 7 cm. (0.5 to 1.5 inches) long, and is attached to one side of the cap. It is colored like the cap, into which it gradually expands, and it is prominently reticulated at the top by the decurrent walls of the tubes. The stem is quite tough.

Old plants sometimes have a disagreeable odor, but when young and fresh, the odor and taste are pleasant and the plants make an excellent dish.



BOLETINUS POROSUS



CLAVARIA STRICTA

THE MUCH-BRANCHED CLAVARIA (edible)

Clavaria stricta

This mushroom belongs to the family of club fungi or *Clavariaceæ*. The club fungi resemble the hedgehog fungi in that the spore-bearing surface, or hymenium, covers the entire outside of the branches, but in the hedgehog fungi the branches hang downward, while in the club fungi they always project upward.

There are many kinds of club fungi, some of which are simply club-shaped and unbranched, while others are very much branched. Some are bright-colored and very beautiful. All of the branched forms are good to eat.

Clavaria stricta is from 5 to 10 cm. (2 to 4 inches) high and grows on decaying wood in the woods. It consists of a mass of upright crowded branches which rebranch several times and end ultimately in several small pointed teeth. The color is very light tan.

Another species that is common is *Clavaria pyxidata*. It closely resembles *Clavaria stricta* in general appearance, but is easily distinguished by the fact that the ends of the branches are cup-shaped instead of pointed.

Either of these species is excellent for soups, stews, or patties. They should be cut up into short pieces. They remind one of noodles or macaroni. If stewed they must be cooked slowly and thoroughly or they will be tough. When fried in butter they are crisp and good.

THE CORAL-LIKE MUSHROOM (edible)

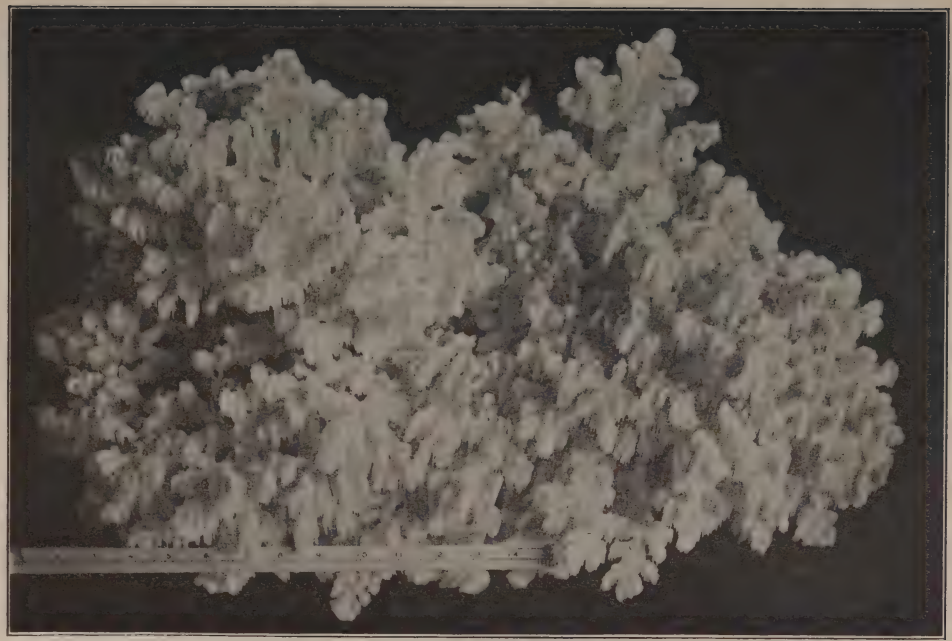
Hydnum coralloides

Hydnum coralloides is perhaps the most beautiful fungus that nature has produced. Elias Fries, a Swedish botanist, was the man who laid the foundation for the study of the higher fungi, and it is said that it was the great beauty of the coral-like mushroom that inspired him, while a mere boy, to determine to devote his life to a study of these plants.

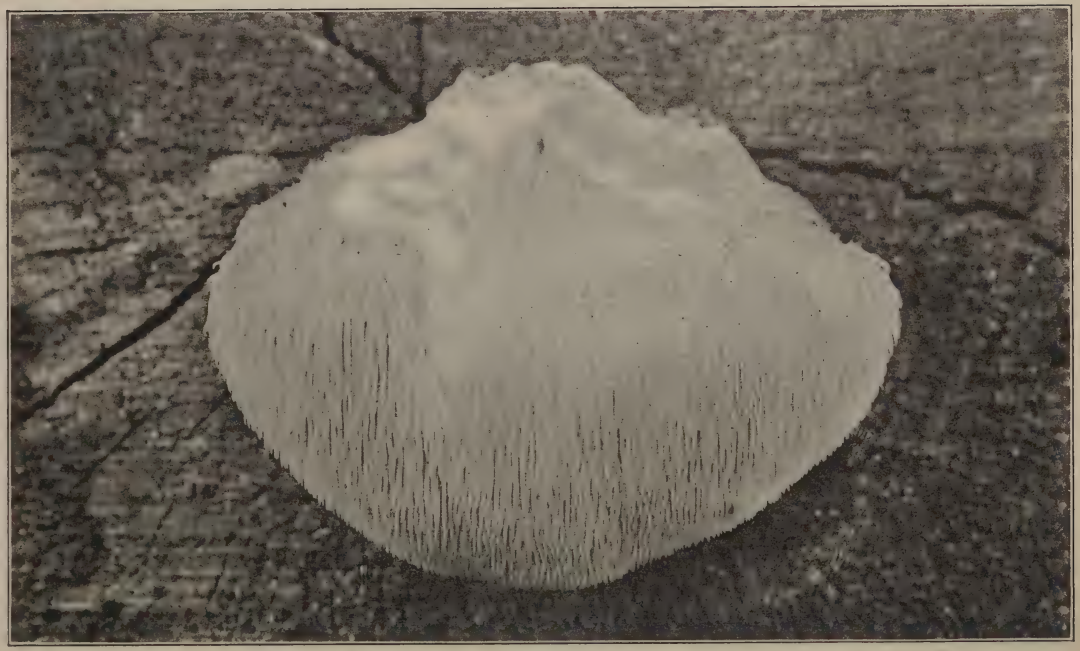
This mushroom belongs to the family *Hydnaceæ*, or hedgehog fungi, so called because the spore-bearing basidia are borne on the surfaces of spinelike projections which are always directed toward the earth.

Hydnum coralloides grows on rotten logs, branches, etc., in the woods from August to frost. The large, pure white tufts arise from a common stem which divides into many branches and then subdivides successively into long graceful shoots. The spines are scattered over the under surface of these branches and hang down for 2.5 to 5 mm. (0.1 to 0.2 inch).

This is considered an excellent edible species. Since the *Hydnums* are sometimes slightly bitter, it is best to boil them for just a moment and throw the water away, then stew slowly. They are excellent for croquettes.



HYDNUM CORALLOIDES



HYDNUM ERINACEUM

THE HEDGEHOG MUSHROOM (edible)

Hydnum erinaceum

This is another very pretty mushroom which grows on logs and stumps in the autumn. The one shown in the photograph was growing on the end of an oak log. This mushroom is pure snow-white like *Hydnum coralloides*, but instead of forming numerous branches it grows as one fleshy mass from the lower surface and sides of which the long spines hang downward. The spines in this case are 10 to 20 mm. (0.4 to 0.8 inch) long.

Another pretty mushroom of this genus is *Hydnum caput-ursi*, the 'bear's-head mushroom,' which is pure white and branched, but with fewer and larger branches than the coral mushroom and with spines as long as the hedgehog mushroom. There are also some *Hydnums* that are woody and form shelves, like *Polyporus*, with spines on the under side, and also some that grow on the ground and are stool-shaped.

THE PEAR-SHAPED PUFFBALL (edible)

Lycoperdon pyriforme

The puffballs are Basidiomycetes in which the basidia bearing the spores are scattered throughout the interior of the mushroom, and there is a definite covering called the 'peridium' around the outside. When the spores are mature, the peridium breaks open and the spores can then be 'puffed' out by pressing on the sides of the mushroom or they may be blown out by the wind.

The genus *Lycoperdon* is characterized by the fact that the peridium opens at maturity by a definite mouth at the top. *Lycoperdon pyriforme* is a small puffball which grows in dense clusters on decaying wood and is common everywhere. The surface is covered with minute wartlike scales. The color is white or light brown. The stem is very short or almost lacking, but there are always rootlike strands of mycelium extending from the base of the mushroom into the rotten wood.

Another common small puffball is *Lycoperdon gemmatum*. It grows on the ground either in the woods or in open places. When young the whole plant is white. It is easily recognized by its shape, which is like a top, and by the erect scales on the surface, which are of two sizes, the larger ones later falling away and leaving circular scars on the surface.

All puffballs are good to eat if they are white throughout the interior. When the spores begin to ripen the mushroom becomes dark-colored inside and is then bitter and not edible. The species of *Lycoperdon* do not have as good a flavor as the larger puffballs, which belong to the genus *Calvatia*. There is one puffball called *Scleroderma vulgare* which is always purple on the inside even in very young stages, and it is the only true puffball that is never edible.

LYCOPERDON PYRIFORME

CALVATIA CYATHIFORME

THE CUP-SHAPED PUFFBALL (edible)

Calvatia cyathiforme

In the genus *Calvatia* the peridium does not open by a definite mouth, but crumbles away from the upper part of the mushroom irregularly. This genus includes the largest and best of the edible mushrooms.

Calvatia cyathiforme is called the cup-shaped puffball because the old base of the plant after the spores have been scattered often resembles a broad cup on a stout stemlike base. These old bases can often be found the following spring after the spores have been scattered. This species grows in pastures and other grassy places in August and September. It is 5 to 10 cm. (2 to 4 inches) in diameter, and entirely white when young. There are several other species that look very much like this in the young stages — that is, when they are wanted for food — but, since they are all equally good so long as they are white throughout, it is not necessary to distinguish them when collecting for the table.

Perhaps even better than the above, but not so common, is *Calvatia gigantea*, the giant puffball. This mushroom is a rounded white mass resting on the ground and attached by cords of mycelium. It is usually 20 to 40 cm. (8 to 16 inches) in diameter, but occasionally it gets much larger than that. It is the largest fungus known. It should be peeled, sliced, and broiled or fried.

A very interesting group of puffballs is the genus *Geaster*, called 'earth star,' in which the outer part of the peridium splits into starlike segments which spread out in dry weather and close up in wet weather.

THE COMMON STINKHORN MUSHROOM (not edible)

Phallus impudicus

The stinkhorn fungi are closely related to the puffballs. In the young stage, or egg stage as it is called, the stinkhorn looks very much like a puffball. As it matures, however, the peridium bursts at the top and the central portion grows upward very rapidly forming a stem and cap, while the peridium forms a volva at the base. The basidia which bear the spores are on the outer surface of the cap.

The common stinkhorn mushroom grows on lawns and other grassy places from June to September. It is usually about 12 cm. (5 inches) tall. The volva is thick and light pink in color. The stem is soft and porous and white. The cap, which is pitted much like a morel, is covered with a thick green liquid which contains the spores. The odor is extremely disagreeable.

Dictyophora duplicata is another stinkhorn mushroom which differs from *Phallus impudicus* by having a beautiful white lace-like veil hanging down around the stem from the base of the cap.

PHALLUS IMPUDICUS

MUTINUS CANINUS

THE CYLINDRICAL STINKHORN (not edible)

Mutinus caninus

In the genus *Mutinus* there is no distinct cap, but the dark-green liquid containing the spores covers the upper portion of the stalk. *Mutinus caninus* is a very pretty plant. The volva is flesh-color. The upper end of the hollow stalk is pink, but is covered with the green spore-bearing mass. Below the spore-bearing part the pink fades out to white at the base of the stalk. The odor is almost as disagreeable as is that of the common stinkhorn.

Another very interesting group of mushrooms which are closely related to the puffballs is the family *Nidulariaceæ* or bird's nest fungi. Each of these consists of a little nestlike cup, usually not more than one or two centimetres high and half as broad, inside of which are a number of small white or black bodies resembling eggs in a nest. The spores are produced inside of these eggs, and each egg is therefore comparable to a little puffball.

THE JEW'S-EAR MUSHROOM (edible)

Hirneola auricula-judæ

This mushroom is called the Jew's-ear because it resembles the human ear in shape. It grows singly or in clusters on decaying wood. It varies in size from 2 to 10 cm. (1 to 4 inches), and is chocolate-brown or darker in color. It is soft and somewhat gelatinous when wet and becomes stiff and horny when dry. The Chinese are very fond of it for making soup. It is often cultivated in China on decaying wood, and is imported into this country by the Chinese who do not know that it occurs abundantly in America.

The 'trembling fungi' belonging to the family *Tremellaceæ* are rather closely related to the Jew's-ear mushroom. These consist of jelly-like masses of various colors growing on rotting wood or other vegetable matter. They are all edible, but are rather tasteless and of very little nutritive value.

HIRNEOLA AURICULA-JUDÆ

MORCHELLA CONICA

THE COMMON MOREL (edible)

Morchella conica

The morels belong to the group of fungi known as Ascomycetes, and instead of producing their spores on the ends of club-shaped hyphæ, or basidia, they produce them on the inside of little saclike bodies called asci (see page 13). The hymenium is composed of thousands of these sacs, or asci, placed close together, and the hymenium covers the entire outer surface of the cap.

The morels occur on the ground in early spring, from April to June. They are all edible, and are very easy to recognize. The mushroom consists of two parts, the cap and the stem. The cap is covered with broad irregular pits separated from each other by a network of narrow ridges. The stem is usually quite thick and stout, and both the stem and cap are hollow.

Morchella conica is 5 to 15 cm. (2 to 6 inches) high and the cap is 2.5 to 5 cm. (1 to 2 inches) thick at its broadest part. The cap is elongated and more or less pointed at the upper end. The pits are arranged more or less in vertical rows. They are usually longer than broad, but often are quite irregular in shape.

There are several other species closely resembling *M. conica* that are apt to be found, but since they are all equally good to eat, no harm can come from mistaking one for another of them.

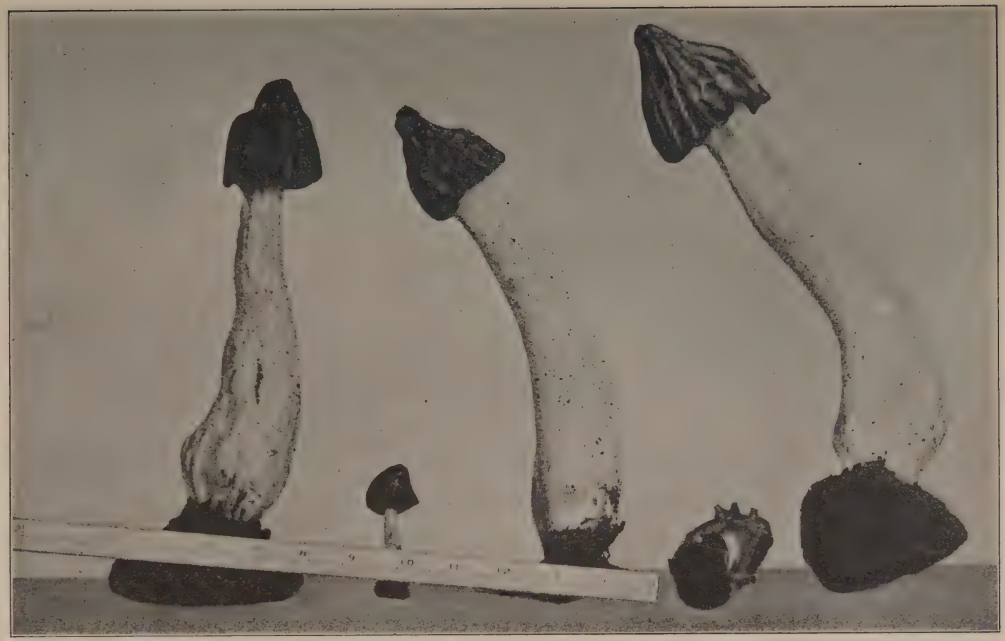
The morels should always be carefully washed before cooking, and soaking for some time in salt water will improve them and insure the absence of any insects that might be within the pits. Simply fried in butter they are delicious, or they may be stuffed and baked.

THE HALF-FREE MOREL (edible)

Morchella semilibera

The half-free morel is so called because the lower half of the bell-shaped cap is free from the stem. It is included here because it differs so greatly from *Morchella conica*, and yet it is apt to be found growing right along with that species. The cap is rarely more than 2 or 3 cm. (1 inch) long and is usually much shorter than the stem. The pits on the surface of the cap are considerably longer than broad. The cap is usually considerably pointed at the top, but deformed specimens occur in which it is hemispherical and very blunt at the apex. The stem is white or whitish, usually more or less mealy, hollow, and often somewhat swollen at the base. The whole plant is 5 to 10 cm. (2 to 4 inches) high. It may be used in any way in which the other morels are used.

Morels should not be gathered immediately after rains, as they are then water-soaked and soon spoil. Special care should also be taken, when collecting on bottomlands, to use only very fresh specimens, since, if they have been soaked by an overflow of water, it is likely that bacterial action will have set in and this makes them unsafe for eating.



MORCHELLA SEMILIBERA

GYROMITRA BRUNNEA

THE BROWN GYROMITRA (edible)

Gyromitra brunnea

The genus *Gyromitra* is closely related to the genus *Morchella* and produces its spores in the same way, but instead of having pits on the surface of the cap, as do the morels, it has wrinkles and plaits or folds which make the cap appear more or less brainlike.

Gyromitra brunnea is a stout, fleshy plant with a distinct stem, and a broad, much-twisted, and folded cap. It grows in the woods in early spring at the same time and under the same conditions as the morels. The whole plant is 7 to 12 cm. (3 to 5 inches) high. The stem is thick, somewhat spongy, hollow, but solid at the base, usually with an irregular surface, and clear white in color.

The cap is 5 to 12 cm. (2 to 4 inches) broad in the widest diameter and somewhat narrower the other way. It is attached closely to the stem in various places, and is rich chocolate-brown above and white beneath. It is tender and fragile and has a good flavor. It should be cooked in the same way as morels.

Another species which is occasionally found is *Gyromitra esculenta*. This is a somewhat larger plant and the brown cap is much more brainlike in appearance. It is edible and good, but one must be careful to use only fresh plants. These mushrooms become so large that they may look perfectly fresh on the outside and still be partly decayed in the interior.

THE RECURVED PEZIZA (edible)

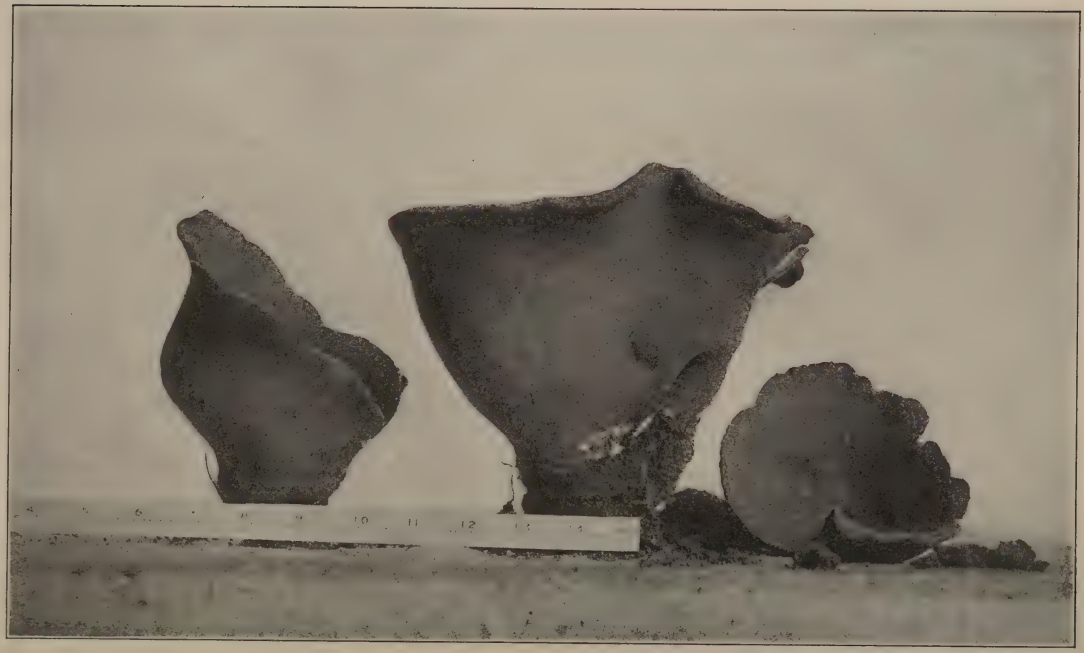
Peziza repanda

This cup-shaped plant grows in moist woods, either on old rotten logs or on the ground, from May to October.

The cups are 3 to 10 cm. (1 to 4 inches) in diameter and grow either scattered or clustered. When very small, they appear like little white knobs. These grow into hollow spheres each with an opening at the top. The sphere then expands and becomes cup-shaped or saucer-shaped, and then nearly flat, with the edge more or less split and wavy and sometimes drooping or curved backward. Below, the cup is narrowed into a short, stout stem which is sometimes rooting. The inner surface of the cup is pale brown or dark brown, and more or less wrinkled toward the center. The outer surface is whitish. The asci containing the spores are on the inner surface of the cup.

There is a very large number of kinds of cup fungi, and they vary greatly in size and color. Some of the very small ones are the causes of plant diseases. All of the larger ones are edible. They are not considered first-class for culinary purposes, but when one cannot get better they are worth collecting. If they are to be stewed, they must be cut into small pieces and cooked slowly. They have a somewhat better flavor, however, when fried crisp in butter.

PEZIZA REPANDA



PEZIZA BADIA

THE BROWN PEZIZA (edible)

Peziza badia

The brown *Peziza* is another common cup mushroom which is of good size and edible. It is not quite so large as *Peziza repanda*, and the entire plant is chocolate-brown in color, though darker inside than outside. It is quite tender and brittle so that it is easily broken.

Peziza scutellata is a very pretty little mushroom that grows on decaying wood. It is nearly flat or disk-shaped. It is bright red in color, and around the edge of the disk there is a row of black hairs that stick straight upward.

There are also several bright-colored cup fungi that belong to the genus *Sarcoscypha*. *Sarcoscypha coccinea*, called the 'scarlet-cup mushroom,' appears very early in spring, often in March. In fact it is usually the first touch of color that one finds in the woods. It grows on decaying sticks and often is partly covered with dead leaves. It is 2 to 5 cm. (1 to 2 inches) in diameter, pink on the outside and bright scarlet on the inside. *Sarcoscypha occidentalis* is much smaller, has a longer stem, and a relatively deeper cup. It is bright red both inside and out. *Sarcoscypha floccosa* resembles *S. occidentalis* in size and shape. It is red inside and pink outside, and has long white hairs projecting from the rim of the cup. *Sarcoscypha tuberosa* is another small species shaped like the last two, but brown in color. It has a long rooting stem which is attached within the soil to a small black tuber-like body, the size of a pea or smaller.

THE BLACK-URN MUSHROOM (edible)

Urnula craterium

The black-urn mushroom grows on partly buried sticks in the woods in spring. When mature it is 3 to 5 cm. (1 to 2 inches) in diameter and 5 to 8 cm. (2 to 3 inches) in height. It is dark brown or black in color and is composed of fleshy-leathery material. At first the cup is entirely closed, and it opens first by a small star-shaped rupture at the top which gradually gets larger as the mushroom matures. The stem is stout, often grooved or wrinkled, and colored like the cup. The entire outer surface of the mushroom is velvety from the presence of minute black hairs. Although these plants do not look especially appetizing, they are edible and good.

Another black mushroom that is closely related to *Urnula* is *Bulgaria inquinans*. It differs from *Urnula* in being composed of thick pulpy gelatinous material and in having a rather shallow cup which is light-colored on the inside. It is edible, but not very good.

URNULA CRATERIUM

XYLARIA POLYMORPHA

THE BLACK-FINGER MUSHROOM (not edible)

Xylaria polymorpha

This mushroom is representative of a large group of Ascomycetes or sac fungi in which the sacs (asci) containing the spores are produced in structures called 'perithecia.' A perithecium is a flask-shaped pocket in the fungus tissue with a more or less definite wall and usually with a necklike opening at the top.

The black-finger mushroom is the largest species of *Xylaria*. There are many small species that resemble this except in size. This plant grows on decaying wood usually at the base of a stump. The black finger-like body is called a 'stroma.' It is rather woody in texture and so not edible. It is white within, but has a black layer around the outside. In the young stage the upper part of the stroma is whitish, due to the fact that it is growing rapidly at the tip and also is producing light-colored spores that are born neither in sacs nor on basidia, but are simply cut off at the ends of hyphæ or threads such as compose the entire stroma. Such spores are called 'conidia.' Later the surface becomes entirely black and the perithecia develop in the black surface layer.

THE RHINOCEROS-BEETLE CORDYCEPS (not edible)

Cordyceps Melolanthæ

This is another mushroom which produces its spore-containing asci in perithecia. It is of especial interest because it is a parasite on an insect. It causes a disease of a large 'white grub' which is the larval stage of the rhinoceros beetle, a close relative of the familiar 'June bug.' The mycelium of the fungus grows within the insect and the insect is finally killed and mummified. The mycelium then continues to grow in the dead insect and produces one or more upright stromata. These are white and fleshy. Probably they would be good to eat, but it is doubtful whether any one has ever cared to try them. Near the upper end of the stroma an enlarged portion, such as is shown in the second figure from the left in the photograph, is produced, and in this the perithecia are developed.

This is the largest species of *Cordyceps*. There are a number of smaller species which have habits similar to this one, being parasitic on different kinds of insects.

The 'ergot' of rye (*Claviceps purpurea*) is a closely related fungus which causes a destructive disease of rye, but at the same time is useful in medicine.

CORDYCEPS MELOLANTHÆ

GLOSSARY

OF

THE TERMS MOST COMMONLY USED IN DESCRIBING MUSHROOMS

Abnormal. Not properly developed.
Acrid. Biting to the taste.
Adnate. Gills attached squarely to the stem.
Adnexed. Gills attached to the stem only at the upper corner, the remainder being free.
Alutaceous. Pale tan in color.
Anastomosing. Running together irregularly.
Annulus. The ring formed on the stem by the inner veil.
Azonate. Not zoned.

Basidiomycetes. Fungi which produce their spores on basidia.
Basidium. A club-shaped end of a hypha on which four spores are borne.
Buff. Pale creamy-gray in color.
Bulbous. The base of the stem enlarged.

Cæspitose. Plants in dense clusters but not grown together.
Campanulate. Bell-shaped.
Cap. The pileus of a mushroom.
Cartilaginous. Tough-brittle. Breaking with a snap like a piece of cartilage.
Cell. One of the protoplasmic units into which the hyphæ of fungi and all parts of other plants are divided.
Cinereous. Ashy-gray in color.
Cinnabar. Vermillion or red in color.
Clavate. Club-shaped.
Concave. Cap bowl-shaped.
Context. The inner substance of the cap or stem.
Convex. Cap broadly rounded above.
Coriaceous. Leathery.
Cortex. The outer covering of a stem.
Crowded. Gills almost touching one another.
Cuticle. A thin layer on the surface of the cap.

Dædaloid. With pores like a dædalea.
Decurrent. Extending down the stem.
Deliquescent. Dissolving into an inky fluid through a process of auto-digestion.
Dentate. Toothed along the edge.
Dichotomous. Repeatedly forking. A type of branching.
Dimidiate. Semicircular in outline.
Dissepiments. The walls of the tubes in the pore fungi.
Distant. Gills rather far apart.
Downy. Covered with fine hairs.

Eccentric. Not in the center.
Effused-reflexed. Spread out over the substratum and turned back at the margin to form a cap.
Entire. Not toothed.
Epixylous. Growing on wood.
Excentric. Same as **eccentric.**

Ferruginous. Rusty-red in color.
Fibrous. Composed of tough, string-like material.
Filamentous. Composed of thread-like filaments.
Flesh. The inner substance or context of a mushroom.
Fleshy. Soft and readily decaying.
Free. Gills not attached to the stem.
Fruit-body. The mushroom as opposed to the mycelium or vegetative body of a fungus.
Fulvus. Yellowish brown in color.

Gelatinous. Jelly-like.
Gills. Lamellæ,blade-like structures on the under side of the cap.
Glabrous. Without scales or hairs.
Gregarious. Scattered closely, but not in clusters or tufts.

Habitat. The place of growth of a plant.
Hirsute. Covered with stiff hairs.
Host. A plant or animal on which a parasite lives.
Hymenium. The spore-bearing surface.
Hypha. One of the thread-like filaments of which fungi are composed.

Imbricate. Overlapping like the shingles of a roof.

Infundibuliform. Funnel-shaped.
Involute. Rolled or turned in at the margin.
Irpiciform. Broken up into teeth.

Lacerate. Irregularly torn.
Lamellæ. The gills of a mushroom.
Lateral. Stem attached to one side of cap.
Latex. A juice, usually milky.

Membranous. Thin and pliant like a membrane.
Mushroom. Any fruit of a fungus that is large enough to be studied without a microscope.
Mycelium. The vegetative part of a fungus.
Mycology. The science dealing with fungi.
Mycophagist. One who eats fungi.

Ochraceous. Yellow tinged with red or brown.

Parasite. A plant or animal that lives upon a living host and gets its food from the host.
Partial veil. The inner veil which extends from the margin of the cap to the stem.
Peridium. The outer wall of a puffball.
Pileus. The cap part of a mushroom.
Plicate. Plaited; folded like a fan.
Poroid. Having pores.
Protoplasm. The living substance of plants and animals.
Pruinose. Covered with a fine powder.
Pubescent. Covered with short, soft hairs.

Reflexed. Turned back.
Resupinate. Spread out upon the substratum.
Reviving. Fruit body shriveling in dry weather and taking on its natural shape again when wet.
Rhizomorphs. Cord-like strands of mycelium.
Rimose. Cracked.
Ring. Same as annulus.
Rufus. Dull red.
Rugose. Wrinkled; rough.

Serrate. With teeth along the edge.
Sessile. Without a stem.

Sinuate. Gills notched near the stem.
Spore. A small reproductive body of fungi and many other plants.
Sporophore. Fruit-body.
Squamose. Covered with scales.
Sterigma. A small projection at the end of a basidium on which the spore develops.
Stipe. The stem of a mushroom.
Stipitate. Having a stem.
Stratified. Arranged in layers.
Striate. Having radiating or parellel lines.
Substratum. The material on which a plant is growing.
Sulcate. Grooved or furrowed.

Tawny. Yellowish brown.
Terestrial. Growing on the ground.
Terete. Round.
Toadstool. A stool-shaped mushroom.
Tomentose. Covered with dense wool or hair.
Toxic. Poisonous.
Tubercular-stricate. The striations roughened with small wart-like tubercles.

Umbilicate. With a rounded central depression.
Umbo. A small central elevation on the pileus.
Umbonate. Having an umbo.
Universal veil. The thin outer covering of a young mushroom which may later form a volva.

Veil. *See* **Universal veil** and **Partial veil.**
Vesiculose. Having rounded cells in the context of the pileus as in *Lactarius* and *Russula.*
Villose. Covered with soft weak hairs.
Viscid. Sticky.
Volva. The remains of the universal veil at the base of the stem in some mushrooms.

Zonate. Marked with concentric bands.

CLASSIFICATION OF FUNGI

THE following outline includes only those orders and families of fungi that contain some mushrooms; except that a few other orders are included to show relationships. Orders and larger groups that do not contain any mushrooms are placed in parentheses.

FUNGI

Division: (Myxomycetes) — slime molds
Division: (Schizomycetes) — bacteria
Division: Eumycetes — true fungi
  Class: (Phycomycetes)
  Class: Ascomycetes
    Subclass: (Hemiascomycetes)
    Subclass: (Protoascomycetes) — yeasts
    Subclass: Euascomycetes
      Order: Helvellales
        Family: Geoglossaceæ
        Family: Helvellaceæ — morels, etc.
      Order: Pezizales
        Family: Pezizaceæ — cup fungi
        Family: Cenangiaceæ — black cup fungi
      Order: Tuberales — truffles
      Order: Hypocreales
        Family: Hypocreaceæ — *Cordyceps*, etc.
      Order: Sphæriales
        Family: Xylariaceæ — *Xylaria*, etc.
  Class: Basidiomycetes
    Subclass: (Hemibasidii) — smuts
    Subclass: Protobasidii
      Order: (Uredinales) — rusts
      Order: Auriculariales
        Family: Auriculariaceæ — Jew's ear
      Order: Tremellales
        Family: Tremellaceæ — trembling fungi

Subclass: Eubasidii
- Order: Dacryomycetales — genus *Guepinia*
- Order: (Exobasidiales)
- Order: Agaricales
  - Family: Thelephoraceæ — *Stereum*, etc.
  - Family: Clavariaceæ — club fungi
  - Family: Hydnaceæ — hedgehog fungi
  - Family: Polyporaceæ — pore fungi
  - Family: Boletaceæ — soft pore fungi
  - Family: Agaricaceæ — gill fungi
- Order: Phallales
  - Family: Phallaceæ — stinkhorn fungi
  - Family: Clathraceæ
- Order: Lycoperdales
  - Family: Lycoperdaceæ — puffballs
- Order: Sclerodermatales
  - Family: Sclerodermataceæ — genus *Scleroderma*
- Order: Nidulariales
  - Family: Nidulariaceæ — bird's nest fungi

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MUSHROOMS

By W. B. McDougall

A handbook and pocket guide of mushrooms edible and inedible, ideally arranged for the identification of species found in the fields and woods and containing valuable information on collecting and preparing them for the table.